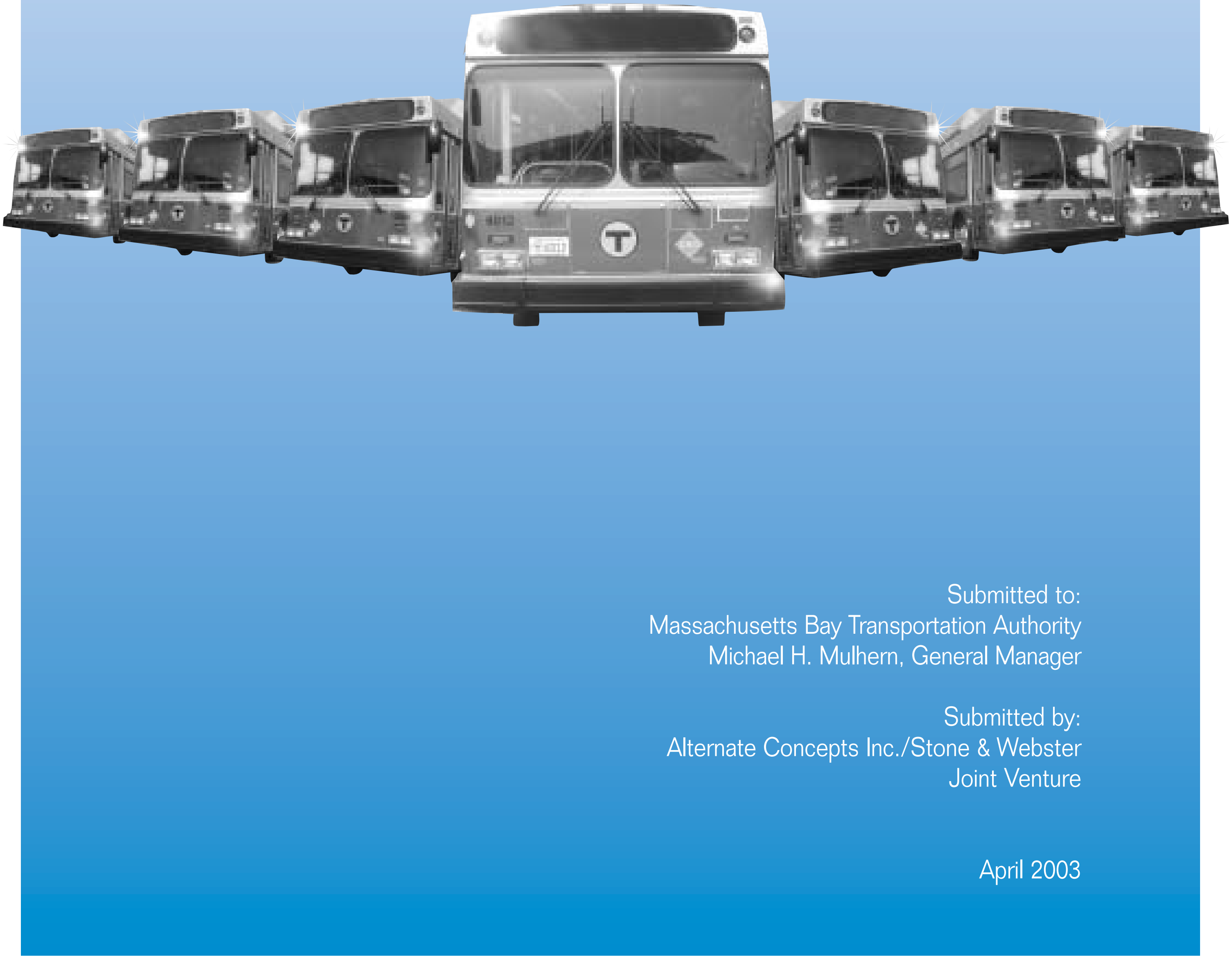
Strategic Plan

for Bus Maintenance Facilities



Submitted to:
Massachusetts Bay Transportation Authority
Michael H. Mulhern, General Manager

Submitted by:
Alternate Concepts Inc./Stone & Webster
Joint Venture

April 2003

Final Strategic Plan for Bus Maintenance Facilities

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Executive Summary

The Massachusetts Bay Transportation Authority (MBTA) initiated the Bus Maintenance Facilities Planning Study to develop a Strategic Plan for bus operations that identifies short, medium, and long-term facility needs based on changes in fleet size, technology and fleet composition; service delivery characteristics; and new service initiatives, specifically the Urban Ring. The *Bus Maintenance Facilities Strategic Plan* serves as a blueprint for future investments in bus maintenance facilities, by:

- Assessing the needs and capacity constraints at existing garages;
- Identifying older out-dated facilities to be phased-out;
- Identifying the proper equipment needed to service a modernized fleet of alternative-fueled buses;
- Guiding site selection for investments in new bus maintenance facilities; and
- Determining the most efficient use of space and equipment at maintenance facilities.

The needs assessment provided for:

- A comprehensive review of bus service characteristics including route structure and terminal points, service frequency, peak and off-peak vehicle requirements, vehicle types, including propulsion technology, wheelchair accessibility, AVL technology, and smart bus technology;
- An audit of conditions at existing bus facilities and an assessment of each facility and its capacity to maintain a modernized fleet; and
- An assessment of the operational impacts of service expansion projects, as well as the operational feasibility of candidate sites for bus maintenance facilities, based on changes in deadhead time and deadhead mileage by route and by facility, and for systemwide impacts.

In response to the needs assessment, the Authority and its consultant researched various sources for available sites for future bus maintenance facilities. Sites considered included MBTA-owned properties, properties available through municipalities, the Commonwealth of Massachusetts, and other state agencies, and privately owned properties available for sale or lease. The property searches were conducted in both the northern service area – Cambridge, Chelsea, Medford, Malden, Saugus, Lynn, Everett and Revere – and in the southern service area – South Boston, Dorchester, Mattapan, Watertown, Roxbury, Roslindale, and Newton. From these listings, the Authority and its consultant identified seven candidate sites for further analysis.

In the northern service area, the candidate sites include:

- Wellington Station, Medford
- One Acorn Park, Belmont / Cambridge Highlands
- Routes 1, 60, and 107, Revere

- 144, 170, and 184 Commercial Street, Malden
- Mishawum Station, Woburn

In the southern service area the sites include:

- Watertown Car Barn, Watertown
- Riverside Station, Newton

The feasibility and systemwide impacts of each site were evaluated across several criteria, including site configuration; operational efficiency (systemwide deadhead miles); community impacts; environmental considerations; cost; and other information as available for the site, including current plans for future use/development.

Based on this analysis, Wellington, in the northern service area, and Riverside, in the southern service area, are recommended as the most promising sites.

Wellington presents a unique opportunity for the MBTA to accommodate the service expansion required by the Urban Ring Program and eliminate two very old, costly, and inefficient maintenance facilities, one of which has been a consistent source of resident complaints, with the construction of a single modern maintenance facility. The Wellington option has the following very desirable characteristics:

- The MBTA owns the property, and would not need to take property, thereby not effecting the tax base of the town.
- The Fellsway Garage could be demolished, and the land made available for development of a type more compatible with the needs and desires of the surrounding community.
- The Lynn Garage would be converted to a layover facility for bus storage, fueling, and washing, with only "pullout repairs" performed at the sight.
- All the anticipated requirements of the Urban Ring are served effectively and efficiently.
- The Wellington site has no abutters, with the Kiss 108 Radio Station as its nearest neighbor.
- The vehicular access and road connections that characterize this site are efficient, and are not intrusive on residential streets.
- The net change in deadhead mileage over the current distribution of routes is near zero.
- Commuters would have the same or greater parking capacity, conveniently located. The commuter parking structure presents an opportunity for business development as a joint development project.

Of the two southern options, Riverside has superior traffic flow characteristics, is less intrusive on the neighborhood, and has greater fleet storage capacity. The construction of a bus maintenance facility at Riverside would allow the MBTA to satisfy the needs of the Urban Ring in the south service area, while continuing to provide the excellent quality of service to it's current express route commuters. Implicit in this plan is the upgrade of the

Albany Garage to increase its maintenance capacity as described earlier in this report. The benefits of this plan are:

- All the Urban Ring requirements would be effectively and efficiently met by operations out of the Albany Garage, while express bus service would be easily displaced to the new Riverside facility.
- The MBTA owns the property, and would not need to take property, thereby not affecting the tax base of the town.
- The only abutter is the Holiday Inn.
- Commuter parking will, at a minimum, remain at current levels, and the commuter parking facility will be designed to accommodate an increase in commuter parking capacity.
- The vehicular access and road connections that characterize this site are efficient, and are, for the most part, not intrusive on residential streets.
- The deadhead mileage incurred by this scenario is somewhat greater than in the current route distribution. An administrative modification to the schedules could significantly reduce or eliminate the difference. An opportunity may exist for total mileage reduction by considering a mid-day layover of express buses at Albany and/or Cabot.
- The commuter parking structure presents an opportunity for business development as a joint development project.

The Plan as proposed would accommodate all the needs of the Urban Ring with no increase in the number of bus maintenance facilities (although there would be one additional Transportation Rating Station, e.g. bus storage location). The 77-year-old Fellsway garage, a constant source of disruption to residential neighbors, would be decommissioned. The Fellsway garage is currently operating as a maintenance facility, with the associated overhead, for a fleet of 63 buses. The net operating efficiency (total deadhead mileage) would remain approximately unchanged from the current distribution of routes. The plan would increase the total tax base if the Fellsway Garage land were privately developed. Commuters would suffer no reduction in parking, and may enjoy an increase, and will also find parking more conveniently located. Private business may have the opportunity to participate in joint development of areas that are publicly owned. And finally, bus maintenance capability would, by this plan, be made adequate to accept and maintain the new technology rolling stock that will enter the MBTA fleet over the coming decades.

The Plan will alleviate crowded conditions at the Charlestown bus maintenance facility, and to address the diversity of needs presented by the incorporation of new fuel and smart bus technologies. By conservative and creative use of existing MBTA facilities, this Strategic Plan accomplishes those service needs while improving its relation to the communities it serves and permitting business opportunities and a possible increased tax base.

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Goals and Objectives

The Massachusetts Bay Transportation Authority (MBTA) initiated the Bus Maintenance Facilities Planning Study to develop a Strategic Plan for bus operations that identifies the short, medium, and long-term facility needs based on changes in fleet size, technology and composition; fleet maintenance requirements; service delivery characteristics; and new service initiatives, specifically the Urban Ring. The *Bus Maintenance Facilities Strategic Plan*, as provided herein, will serve as a blueprint for future investments in bus maintenance facilities. The *Bus Maintenance Facilities Strategic Plan* was designed and developed to address the following key goals and objectives of the MBTA:

- **Support the implementation of the Urban Ring Service.** The Urban Ring Project is a transit initiative designed to connect the existing radial transit lines with a multimodal circumferential transit system bringing much improved access to and reducing congestion within the radial travel corridors. The Urban Ring bus services will be implemented over two phases. The first implementation phase of the Urban Ring will provide service on two (2) new express routes, eight (8) new cross-town (CT) routes, and the expansion of three (3) existing CT routes. The second implementation phase of the service will require 60-foot articulated buses to provide service on seven (7) overlapping Bus Rapid Transit (BRT) routes and approximately ten (10) miles of separate busways on existing right-of-way. It is estimated that this service will, at its peak, introduce approximately 100 buses to the MBTA's bus fleet. It is the goal of this strategic plan to ensure that the operations and maintenance needs of the Urban Ring initiative are met through the Bus Maintenance Facilities Strategic Planning effort.
- **Support Community Needs and Desires regarding Site Locations.** The MBTA currently owns and operates facilities within residential neighborhoods in and around Boston, and seeks to be a "Good Neighbor" within these communities. As a regular course of business, the Authority participates in public outreach for its capital investment program, and employs operating procedures for public outreach in the development of all capital projects. Through its community outreach programs, the Authority seeks to make transportation decisions that meet the needs of all people; construct facilities that fit more harmoniously into communities; and minimize and/or mitigate unavoidable impacts by working with communities to identify concerns and develop mitigation strategies that benefit the affected communities. In keeping with this tradition, it is the MBTA's desire to move bus maintenance facilities out of residential neighborhoods and into areas with compatible land uses. Specifically, it is the goal of this strategic plan to solely consider commercial or industrially zoned sites for future bus maintenance facility construction, specifically those sites in areas where the adjacent land is of a more compatible use.
- **Support bus operations and maintenance policy directives.** As part of its continued reinvestment in the bus fleet, the MBTA plans to purchase 354 40-foot CNG buses, thirty-two (32) 60-foot articulated dual-mode diesel/electric buses, and 145 40-foot and 30 35-foot low floor Environmentally Clean Diesel (ECD) buses.

The MBTA is designing and constructing new bus maintenance facilities at Southampton and Arborway and has plans to renovate the Everett, Cabot and Charlestown facilities to address the diversity of needs presented by the incorporation of these technologies. It is the goal of this strategic plan to support operations and maintenance policy directives to improve the quality, safety, operating efficiency and accessibility of bus services by ensuring all future facility designs accommodate a modernized fleet of accessible, alternative fueled buses.

- **Minimize Operations and Maintenance Costs.** Changes in service plans, especially those that expand the bus system, may present significant operations and maintenance costs to the Authority. For example, if maintenance facilities are located farther away from services, vehicle miles traveled will increase, causing increases in all associated cost factors, including the number of operators needed to provide services; consumption of fuel; frequency of maintenance inspections; use of consumables; and the number of mechanics required to maintain the bus fleet. It is the goal of this strategic plan to improve cost-effectiveness and optimize operations within the MBTA's bus operations. As such, this strategic planning effort sought to minimize costs, by minimizing systemwide deadhead and maximizing the use of existing MBTA-owned property.

Introduction and Background

The Massachusetts Bay Transportation Authority (MBTA) faces unique challenges as a 105-year-old transit system that is seeking to carry-out a strategic approach to planning for the future of its bus operations. As public transit in Boston evolved from the Boston Elevated Railway Company (1897) to the Metropolitan Transit Authority (1947) to the MBTA (1964), many of the surface line carhouses used by streetcars and trackless trolleys were publicly acquired and later converted to bus garages. Boston's first bus route opened in 1922, and the first trackless trolley line in Boston soon followed in 1936. To accommodate the maintenance needs of the new bus system, trolley carhouses in Allston (1922) and Medford (Fellsway 1925) were converted to bus garages. The growing demand for bus service to the south of Boston necessitated the conversion of carhouses in Quincy (1930) and Roxbury (Bartlett 1931) to bus garages. This trend continued through the early 1970's with the bulk of today's bus system evolving from converted streetcar lines, and garage locations dictated by the location of old carhouses, including Lynn (1936), and Albany Street (1941). Of the MBTA's present-day bus garages, only the Cabot and Charlestown facilities were sited through modern-day planning processes in response to service for a specific geographic area.

Over the past century, Boston's public transit system has grown from a rail system serving fourteen (14) cities and towns to a complex multi-modal operating agency, providing bus and rail service to 175 communities throughout Eastern Massachusetts. While service characteristics have evolved to meet the changing transportation needs and growth in the region, the locations of bus maintenance facilities, by and large, have remained unchanged.

The MBTA's current bus operations are comprised of 1,022 buses and trackless trolleys, providing service on 159 routes over approximately 710 route miles. On an average weekday, the MBTA Bus Operations Division provides bus service to approximately 380,000 customers with buses traversing 88,000 service miles. The MBTA maintains the bus fleet from seven (7) existing bus maintenance facilities and has plans to construct two (2) new maintenance facilities, and renovate three (3) existing facilities to accommodate the acquisition of alternative-fueled – clean diesel, compressed natural gas (CNG), diesel electric hybrid, and dual-mode diesel/electric – vehicles.

The MBTA is in the process of designing and constructing two new maintenance facilities – Arborway and Southampton. The Arborway facility will provide for the maintenance and storage of CNG and diesel buses. This new facility will replace the aging and undersized Bartlett Street garage. A recent decision to restore streetcar service on the Arborway line will result in a shared streetcar facility at the Arborway location. The Southampton facility, in South Boston, when complete, will provide for the maintenance and storage of CNG and dual-mode diesel/electric hybrid buses. These initiatives are supported through an investment of approximately $90 million for the construction of the Arborway and Southampton facilities, and approximately $20 million for the conversion of existing facilities (Everett, Cabot and Charlestown) to fuel, store, and maintain CNG buses.

The current bus fleet is comprised of 978 diesel buses, two (2) CNG buses, two (2) diesel/electric hybrid buses, and forty (40) trackless trolley vehicles. The MBTA's capital investment program for FY 2002 to FY 2006 calls for the procurement of:

- Forty (40) 60-foot articulated CNG rapid transit buses to replace a portion of the retiring 1985 to 1987 RTS diesel buses;
- Three Hundred Fourteen (314) alternative-fueled buses to replace 280 1986-87 RTS buses and thirty-four (34) 1989 RTS diesel buses; and
- Twenty-eight (28) trackless trolleys to replace the existing fleet.

The MBTA has plans to retire all pre-1994 buses no later than December 2004.

As part of the MBTA's continued reinvestment in the bus fleet, the MBTA has in place procurements for a total of 354 CNG buses (314 to be purchased by 2004), and thirty-two (32) dual-mode diesel/electric buses. The MBTA recently awarded a contract to Neoplan for the procurement of 175 ECD buses. The alternative-fueled bus fleet will be comprised of:

- Fifteen (15) 40-foot New Flyer CNG buses;
- Two hundred ninety-five (295) 40-foot NABI CNG buses;
- Forty-four (44) 60-foot Neoplan articulated CNG buses;
- Thirty-two (32) 60-foot articulated dual-mode diesel/electric buses; and
- One hundred forty-five (145) 40-foot and thirty (30) 35-foot, Neoplan ECD buses.

To support future decisions regarding propulsion technologies, the MBTA conducted two studies – the *1999 Future Bus Prototype Study* and the *Roadway Powered Electric Transit Bus Demonstration Project*. As a result of the *1999 Future Bus Prototype Study*, the MBTA placed two (2) CNG and two (2) diesel/electric hybrid buses in revenue service. The *Roadway Powered Electric Transit Bus Demonstration Project* resulted in four (4) prototype buses for use by the MBTA and by Massport.

In July 2002, the MBTA assembled an expert panel to evaluate the available low emissions bus engine technologies and fuels, and recommend the most appropriate choice for the upcoming purchase of 200 buses to be delivered in 2004. The Panel, headed by Prof. John Heywood of the Massachusetts Institute of Technology, reviewed promising engine technologies and fuels, focusing especially on the two low-emission options currently available: CNG and emissions controlled diesel (ECD). In accordance with the MBTA's long-term plan to continue to reduce the total emissions from its bus fleet, the Panel concluded that, from a total systems perspective, it is in the best interest of the

MBTA and the communities it serves, to purchase 200 buses with the best available ECD engine, which use particulate filters and ultra low sulfur fuel.[1] The MBTA has accepted this guidance in its most recent procurement of 175 Neoplan ECD buses, which will enter service by the end of 2004. The expert panel also set forth a monitoring program to determine the actual performance of ECD buses over time compared to their predicted performance.

In addition to implementing new fuel technologies, the MBTA is aggressively seeking to implement improvements to its bus communications technology and transit Intelligent Transportation System (ITS) strategies. The MBTA plans to modernize the Bus Operations Control Center (Bus OCC) at the 45 High Street facility, which, when completed, will feature state-of-the-art technology permitting real-time monitoring and supervisory dispatch of the bus operations. This technology is currently implemented on the Silver Line Phase I.

The MBTA plans to improve and expand bus services over the short and long-term. Short-term service improvements are identified in the *Preliminary 2002 Service Plan: Proposed Bus Service and Service Policy Modifications.* This draft Service Plan presents a number of proposed major service changes, as well as proposed modifications to the MBTA's Service Delivery Policy. Expansion of the existing bus system will be achieved through the implementation of the Silver Line and the Urban Ring. The Silver Line is providing service along Washington Street and will be in service on the South Boston Piers Transitway in December 2003. Phase III of the Silver Line will be completed in 2010.

The Urban Ring is a proposed 15-mile circumferential transit corridor connecting the terminal stations of Boston's downtown-centered transit system in or near six (6) cities that form the urban core, including Boston, Chelsea, Everett, Somerville, Cambridge and Brookline. Service in the Urban Ring corridor will likely be implemented in three phases with the first two phases expanding the bus system. The first phase will consist of two (2) new express routes and eight (8) new cross-town (CT) routes. In addition, three (3) existing CT routes will be expanded. The second phase of the project is for seven (7) overlapping Bus Rapid Transit (BRT) routes and approximately ten miles of separate busways on existing right-of-way.

As the Authority plans for the expansion of bus service, the largest of which is the Urban Ring, and the incorporation of an accessible, modernized bus fleet, it recognizes the need to assess the capacity and location of existing facilities and to plan strategically for additional capacity at new facilities. The bus maintenance facilities strategic planning effort identified the short, medium and long-term facility needs based on changes in fleet size, technology and composition; fleet maintenance requirements; and service delivery characteristics. The *Bus Maintenance Facilities Strategic Plan* will serve as a blueprint for future investments in bus maintenance facilities by:

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[1] *FY 2003 Two Hundred Bus Procurement*, Expert Panel Report to the Massachusetts Bay Transportation Authority, October 2, 2002.

- Assessing the needs and capacity constraints at existing garages;
- Identifying older out-dated facilities to be phased-out;
- Identifying the proper equipment needed to service a modernized fleet of alternative-fueled buses;
- Guiding site selection for investments in new bus maintenance facilities; and
- Determining the most efficient use of space and equipment at maintenance facilities.

Needs Assessment

Approach

The bus maintenance facilities strategic planning process began with a full assessment of conditions at each of the existing bus garages – Fellsway, Lynn, Quincy, Albany, Charlestown, Everett, and Cabot. The maintenance, parking, transportation and fueling areas of each facility were assessed with respect to existing functions and service requirements. This analysis provided an inventory of general conditions of the structural, architectural, electrical, mechanical, site components and major equipment at each bus maintenance facility. Future maintenance requirements, as dictated by changes in the fleet size, technology and composition, as well as the fleet requirements of bus service expansion initiatives, were analyzed in light of these conditions.

A key component in determining capacity constraints and the need for additional capacity is the assignment of buses, as needed to cover all of the MBTA's bus routes, to specific garage locations. Primary considerations in achieving the optimum assignment of vehicles to specific garage locations include:

- Minimizing overall deadhead time and deadhead mileage between bus route revenue service points and garage locations;
- Composition of the fleet at each garage (in terms of vehicle type) and the matching of this composition to specific route requirements; and
- Existing conditions that already dictate assignments of vehicles to specific garages, such as the Silver Line service and the Arborway and Southampton facilities.

In determining the future bus maintenance facility needs, careful consideration was given to the maintenance requirements associated with existing service and service planning initiatives including the Urban Ring and major service modifications. Based on the anticipated implementation of the Urban Ring service, milestone years were defined to identify maintenance requirements necessitated by future service requirements and the anticipated fleet technology. The milestone years were defined by major changes to the bus system including the procurement of new equipment, the construction of new facilities and the implementation of new services. The milestone years are defined by major enhancements to services and facilities, as follows:

- **2004:** The new Southampton Garage is scheduled for completion in the Spring of 2004, and will be available for storage, fueling and maintenance of 60-foot articulated low floor CNG buses. The capacity of the facility will be seventy-six (76) vehicles, of which forty-four (44) are 60-foot articulated low floor CNG buses, and thirty-two are 60-foot articulated dual-mode diesel/electric low-floor buses to be operated on the South Boston Transitway. The Washington Street Silver Line is currently operating eleven (11) 40-foot low floor CNG buses, and four (4) 40-foot low floor CNG buses are available for spares. These vehicles are currently housed in the Cabot garage, maintained in the Charlestown garage, and fueled off-site at the Everett industrial area CNG fueling station near the Charlestown bus garage. An additional thirty-two (32) low floor 60-foot articulated dual-mode diesel/electric vehicles would be required for the South Boston Transitway portion of the Silver Line. The Piers Transitway is scheduled to open by 2004.

- **2010:** The Arborway Garage, scheduled to be completed in June 2005, will have the capability of fueling, maintaining, and storing 60-foot articulated low floor CNG buses. The capacity of Arborway will be 118 vehicles. The Bartlett garage, which now stores 159 diesel buses, is scheduled for closure by Spring 2004. By 2010, the first round of improvements for the Urban Ring (Phase 1), which includes three (3) new express bus routes and eleven (11) cross-town routes, will be implemented. Phase III of the Silver Line should also be completed by 2010, when South Station and the New England Medical Center / Boylston Street Station are connected. The Silver Line will by then be providing service from Dudley Station to the World Trade Center via dual-mode vehicles.

- **2015:** Phase 2 of the Urban Ring Project will be implemented by 2015, and the peak demand for bus storage facilities will occur during this period, since Phase 2 of the Urban Ring will require more buses than Phase 1 and fewer than Phase 3.

- **2025:** The Phase 3 bus service on the Urban Ring is the same as the bus service provided in during Phase 2, less the Bus Rapid Transit Route 5, New Lechmere-Longwood Medical Area. This reduction in service would only reduce peak bus requirements by four (4) vehicles at the Albany garage. Other CT, BRT and local routes may lose riders due to diversions to the new light or heavy rail lines. The time of complete implementation of the Phase 2 bus routes, therefore, represents the peak of bus storage needs for the next fifteen to twenty years.

The needs assessment included a full review of bus service characteristics including route structure and terminal points, service frequency, peak and off-peak vehicle requirements, vehicle types, including propulsion technology, wheelchair accessibility, AVL technology, and smart bus technology.

Using existing data and maps, the baseline, 2002, condition was defined by the location of bus routes, the location of existing bus maintenance facilities, and the existing assignment of buses (by vehicle type) and bus routes to maintenance facilities.

Building from the baseline condition, needs were identified through the evaluation of each milestone year, reflecting the implementation of major service modifications, the introduction of new vehicle types, changes to existing bus routes, and the implementation of new services through time, keeping facilities fixed. The needs assessment assumed that no additional maintenance facilities would be constructed in the future.

Within each milestone year, new bus routes were assigned to specific facilities in a manner that minimized system deadhead mileage and travel time, and also recognized the capacity constraints at existing facilities. This assignment of routes was then compared to the inventory and assessment of facility conditions and capacities so that the need for renovations to existing facilities and the demand for additional facilities could be determined.

Once all vehicles were assigned to bus maintenance facilities, deadhead time and deadhead mileage were calculated for each route. These deadhead factors were summed for each facility and aggregated to calculate a systemwide deadhead time and mileage for each milestone year, thereby providing a metric to use in comparing proposed recommendations.

Opportunities for Enhancement

Through the needs assessment several opportunities to enhance the bus maintenance system were identified. These opportunities are categorized based on term:

- Short-term needs (or Phase I) includes retrofits and renovations to existing bus maintenance facilities;
- Medium-term needs (Phase II) includes phasing-out and replacing older, out-dated facilities with new bus maintenance facilities; and
- Long-term needs (or Phase III) addresses additional capacity at new facilities to accommodate operations and maintenance needs of the Urban Ring initiative.

Phase I

The Quincy, Albany, and Charlestown garages from capital cost point of view should be rehabilitated to provide more efficient and environmentally acceptable operations. Specific needs at each garage are noted below.

Quincy

Finding: Equipped with existing pits, the construction of usable roof level maintenance platforms is restricted by the low overhead clearance of the Quincy garage (12-feet, 3-inches). The installation of an overhead crane at this facility is problematic for the same reason. The use of lifts is also severely restricted by the height of the Quincy garage, presenting a problem in the maintenance of low floor – CNG and 60-foot articulated – buses. Maintaining low floor buses at Quincy would be impractical without height modifications as well as rehabilitation/updating of the facility. The height restriction in the Quincy maintenance facility is a problem for CNG bus maintenance, as the normal installation of gas tanks on the roof (required with low floor buses) adds to the height of the bus. In addition to restrictions on lifting, the presence of the tanks and part of the fuel delivery system on the roof necessitates rooftop maintenance, which would also be constrained for a mechanic on a platform. The Quincy garage can be nominally adapted to maintain articulated 60- foot buses in that it has one 70-foot pit in place, and each of the existing four (4) pits can be extended. Three post hoists could not, however, be installed for use in the remaining floor area of the shop, as there is insufficient clearance to lift the entire bus to a useful height.

Immediate Need: The garage roof consists of wood planks, timber stringers, timber girders and steel trusses. The steel roof trusses are about 15-feet on-center and support the timber roof girders at the truss third points. These trusses are supported by the east and west walls of the garage. If the two northern most trusses are cut in the maintenance area (eastern third of the trusses), the vertical clearance in the maintenance area may be increased from approximately 12-feet, 6-inches to approximately 16-feet, 6-inches. This solution would provide for a better and safer maintenance operation by allowing a 40-foot bus to be lifted to a usable height.

The estimated cost to complete the structural modifications to the Quincy bus garage is approximately $300,000. This estimate is comprised of $30,000 in engineering costs; $110,000 in materials, and $160,000 in labor – this is a labor-intensive effort. This cost estimate provides a ballpark figure for the proposed structural modifications; a detailed design would provide refined cost estimates.

Mid-Term Need: Raise the roof of the garage and install two lifts and roof level platforms for each pit, and install one overhead crane.

Albany

Finding: The maintenance area of the Albany garage was originally equipped with one pit, which has been decommissioned. Currently, the building is configured with four (4) herringbone workstations, three (3) with lifts and one (1) flat floor. The total maintenance capacity at the Albany garage is currently stretched to the limits for the existing fleet. The introduction of low floor buses would create the need for the pit/platform positions, which should be an addition to the current lift and flat floor capacity. This would necessitate the redeployment of indoor storage space, building expansion, or other significant remodeling.

The current maintenance area of Albany bus garage could not be easily adapted to maintain a fleet of 60-foot articulated buses. The long, narrow shape of the shop does not permit 70-foot work bays as currently laid out. The removal of the herringbone positions, and replacement with longitudinal positions would result in two (2) work positions or at best three (3) work positions, if two were in series. This configuration would be inadequate for the fleet size. Three (3) positions would require a new garage door entry, and would require that buses routinely back into or out of the maintenance bays.

To effectively maintain a fleet of 60-foot articulated buses at Albany, a major renovation of the facility would be required. This must include a reallocation of indoor space, changing some of the indoor storage to maintenance shop space. Other aspects of this facility could be adapted with reasonable ease to accept a fleet of 60-foot articulated buses.

The capacity of the Albany garage is limited for the size of the diesel fleet currently operating out of this facility. CNG buses typically require a greater maintenance effort per bus than diesel buses. This necessitates the requirement to reallocate space within the

Albany facility so as to increase the size and capacity of the shop to the extent necessary to accommodate a CNG fleet of the size limited by the physical storage space available on the site.

This having been done, the fueling system would need to be designed and located so as to create more than a single servicing line.

Need: Albany can be made adequate to maintain 40-foot or 60-foot clean diesel buses by converting some of the indoor storage space adjacent to the maintenance shop such that the resulting shop is approximately twice the current size. Two (2) bays should be made 70 feet long to accommodate articulated buses, and approximately three (3) positions should be converted to pit/platform configuration for the efficient maintenance of low floor buses. One position should have an overhead crane.

Charlestown

Finding: The Charlestown bus garage, the largest and amongst the newest of the MBTA maintenance facilities, requires imperative repairs to the roof, garage doors, and air handling units in the maintenance building. At the time of inspection, April 2002, the most important operational constraint is the repair and replacement of the maintenance garage roof, make-up air units, and overhead doors. Additionally, a critical safety issue that should be corrected immediately is the replacement of the overhead doors that are propped open with wood in the door track.

To accommodate low-floor vehicles, as currently planned for 2004, the Charlestown bus garage will require some modifications to the maintenance area. The Charlestown facility can be easily remodeled to accommodate 40-foot low floor buses by converting some of the flat floor positions to pit/platform positions, and adapting the existing pits to the pit/platform configuration. Lift positions will be required, and those should be upgraded to accommodate the weight of the busses that might be maintained at this location.

Need: The Charlestown garage could be made adequate to store and maintain a fleet of over 200 clean diesel buses. The status as of April 2003 is that the make up air units and the overhead garage doors have been repaired. Only the repair of the roof remains to be completed.

To accommodate 40-foot low floor buses, pit/platform positions should be created, and lifts upgraded to the capacity necessary to lift the buses to be stored their. At least one overhead crane will be necessary.

Phase II-A

Based on the site configuration, size, and bus circulation restrictions; the condition of existing facilities and building systems; the deterioration of maintenance equipment; and the capital cost expenditure for the rehabilitation and retrofit, the Fellsway and Lynn garages should be phased-out.

Fellsway

Finding: The Fellsway bus garage, a converted trolley barn, has six (6) workstations, of which five (5) are lift positions and one (1) is flat floor. The Fellsway facility would require significant modification to accept and maintain low floor and/or CNG technologies, requiring at least two (2) of the lift positions to be converted to pit/platform positions. The existence of ground contamination would likely make the construction of pits problematic. The exterior pavement and the slab in the service lane (bus wash area) would need to be leveled due to the floor clearance issues associated with low floor buses as well as the general problem of suspension and alignment damage caused on any bus stored on this pavement.

The Fellsway garage is located among both commercial and residential uses, with the residential uses located along one side and rear of the property. The Authority installed a tall wood fence to obstruct the view into the yard; however, residential neighbors have complained about the noise and odor disturbances caused by yard and shop activities. In addition, ground contamination caused by diesel fuel is of concern to the residential community at-large.

The prospect of retrofitting the Fellsway garage for CNG is the least advisable. The cost per bus serviced would be higher than any other garages. The need to operate a large compressor frequently in a location that continues to suffer neighbor complaints about noise would certainly be problematic. The age and condition of the structure add further questions to the desirability of considering this facility for any significant investment needed to accommodate future technologies.

Need: In place of the Fellsway facility, new bus maintenance capacity should be constructed in this area to service those vehicles currently maintained at Fellsway; accommodate the existing overflow from the Charlestown facility; and support some of the Urban Ring routes.

Lynn

Finding: The bus garage is located between Camden Street and Western Avenue in Lynn. To the southeast of the facility are industrial uses; northwest of the facility are residential neighborhoods; and northeast are commercial uses. The primary neighborhood concern is the traffic impacts, as bus circulation movements require the use of Western Avenue, which has substantial traffic.

There are six (6) pits and four (4) lifts at the Lynn garage; however, the usefulness of the facility is reduced due to its layout. The pits can be converted to pit/platform positions, but the lifts need to be segregated from the bus storage area in order to be useful for maintenance of low-floor and alternative-fuel technologies. Currently there is no separation between the maintenance area and the bus storage area, at the time of bus pullout the fumes are present at the maintenance lift workstations. This would be true for any internal combustion propulsion technology considered.

The north yard of the Lynn garage is small, and the utilization of this area for pre-trip inspection and lift and/or ramp deployment is problematic – the current logistics for 40-foot buses are strained and limiting.

The age, configuration, and capacity of the Lynn garage lead to the same conclusions as drawn for Fellsway. That is, the cost per bus of the investment necessary to retrofit Lynn for low-floor or alternative-fuel technologies, and make it a functional garage would be substantial. Being located adjacent to a residential neighborhood makes it a potential problem for noise disturbances, especially if high capacity compressors are installed. Further, renovations would not alleviate one of the most disruptive problems to operations, which is the traffic logistics dictated by the geometry of the available space.

Need: In place of the Fellsway facility, new bus maintenance capacity should be constructed in this area to service those vehicles currently maintained at Fellsway; accommodate the existing overflow at the Charlestown facility; and support some of the Urban Ring routes.

Phase II-B

Finding: Future maintenance facility requirements are based on the estimated number of vehicles necessary to operate peak period service for all existing and planned bus services. Specifically, Phase 1 of the proposed Urban Ring Transit program consists of eleven (11) circumferential local routes and three (3) express commuter (EC) routes. CT routes 1, 2, and 3 have been partially implemented and will be expanded during the Phase 1 improvements. The Urban Ring Phase I routes and their proposed operating characteristics require an additional 104 vehicles (approximately) to operate the specified service during the peak period.

The Phase 2 bus service would include CT routes 1, 6, 7, 9, 10 and 11; EC routes 2 and 3; and bus rapid transit routes 1-7. It is estimated that only an additional 5 vehicles would be required for the Phase 2 routes. The Albany garage would require storage of four (4) more vehicles and the Charlestown garage would require six (6) under the Phase 2 implementation, modest increases over the Phase 1 forecasts.

Need: Open a new facility to accommodate the Urban Ring service needs in the vicinity of Routes I-90 or I-93 and inside Route 128 for the provision of service to many of the current and proposed (Urban Ring) express routes. The relocation of this service would free-up space at Albany garage for the introduction of some of the Urban Ring service.

Phase III

Finding: In evaluating the facility impacts of other possible technologies that may come into use in the outer years, only hydrogen-based systems are potentially significant at this time.

Need: Any new facility constructed by the MBTA should be constructed so as to accommodate the use of CNG, which would also allow for hydrogen-based systems.

Recommendations

Development of Recommendations

In response to the needs assessment, the Authority and its consultant researched various sources for available sites. The search for candidate sites began by reviewing listings of properties owned by the MBTA. The Authority also explored opportunities for sharing or purchasing/leasing properties from municipalities, the Commonwealth of Massachusetts, and other state agencies. The MBTA, as part of the consultants' contract, obtained the services of a real estate agent to conduct a search of privately owned properties available for sale or lease.

The property searches were conducted in both the northern service area – Chelsea, Medford, Malden, Saugus, Lynn, Everett and Revere – and in the southern service area – South Boston, Dorchester, Mattapan, Watertown, Roxbury, Roslindale, and Newton.

The property searches resulted in hundreds of available real estate listing across the northern and southern service areas. As a means of identifying the most viable sites, screening criteria were applied for:

- Zoning: Commercial / industrial use;
- Size: Four or more acres; and
- Availability: Currently available for use or for sale.

Using these screening criteria, a short-list of sites (see Appendix A) was identified. In an effort to identify the most promising sites, MBTA staff and/or its consultant toured each of the sites on the "short-list" to determine the suitability of individual properties for further consideration. The site visits afforded the opportunity to better consider various issues including access to/from the site and adjacent and surrounding land uses.

Based on the findings of these site tours, seven candidate sites were identified for further analysis.

In the northern service area, the candidate sites include:

- **Wellington Station, Medford**: The rear parking area of the Wellington Station together with the area within the rail turn around provides sufficient space for a maintenance facility with outdoor or shed storage in a location with no residential neighbors, good road access, and centrally located to the intended service. Combined with layover space at the current Lynn facility, this area would serve the Authority's needs well. Replacement of displaced commuter and special event parking would be required.
- **One Acorn Park, Belmont / Cambridge Highlands:** This privately-owned site is adequate in size (15 acres) for a one-garage scenario, is in close proximity to the

MBTA Alewife Station, and has good road access. The site is distanced from residential neighborhoods by a wooded area, which may pose some concerns.

- **Routes 1, 60, and 107, Revere**: This privately-owned site is adequate in size (14 acres) for a one-garage scenario and has good road access. With or without layover capability at the current Lynn facility, this site would adequately serve the needs of the Authority. Adjacent wetlands and nearby (but not adjacent) housing are concern.
- **144, 170, and 184 Commercial Street, Malden**: This site provides an alternative to Wellington station parking area, as part of a two-garage scenario. In combination with Mishawum Station and layover space at the current Lynn Facility, this site could be used to satisfy the Authority's projected needs. Significant demolition of several existing structures would be required. Near by, but not adjacent housing as well as traffic impacts may pose problems.
- **Mishawum Station, Woburn**: This small MBTA-owned property, with good road access, could be part of a two-garage solution (plus layover at Lynn): In combination with the Commercial Street, Malden property, north service area could be accommodated.

In the southern service area the sites include:

- **Watertown Car Barn, Watertown:** This small facility could be used to accommodate many of the Authority's current express routes and planned Urban Ring express routes with the addition of some amount of structured parking for displaced commuter parking. It is nearly adjacent to express routes serving the south area, and the existing rail maintenance facility can be converted to a bus maintenance facility.
- **Riverside Station, Newton:** Utilizing the commuter parking area at Riverside would provide adequate space to relocate express routes for the south area. Proximity to Route 128, the Massachusetts Turnpike (I-90), and good road access are positive features of this site. Additional deadhead mileage would be incurred for most service displaced from its current base at Albany Street, however other changes within the system may help to offset system-wide deadhead. Proximity to an adjacent hotel and near by residential areas may be problematic. Replacement parking for displaced commuter and special event parking would be required.

Based on the individual characteristics of the candidate sites, build scenarios were developed to address the forecasted capacity needs in both the northern and southern service areas. The build scenarios in the northern service are:

- Construct a 250-bus maintenance facility at Wellington Station and utilize the Lynn Garage as a layover/storage point for commuter service along the North Shore.
- Construct a 140-bus maintenance facility at One Acorn Park (Alewife) and utilize the Lynn Garage as a layover/storage point for commuter service along the North Shore.

- Construct a 250-bus maintenance facility on a commercial property available at Routes 1, 60 and 107 in Revere.
- Construct two smaller facilities one at 144, 170, and 184 Commercial Street in Malden and the other at Mishawum Station, and utilize the Lynn Garage as a layover point for service along the North Shore.

The build scenarios in the southern service area are:

- Construct a 60 to 80-bus maintenance garage at the Watertown Car Barn.
- Construct an 80 to 100-bus bus maintenance garage at the Riverside Station.

Evaluation of Recommendations

Site evaluation criteria were developed to evaluate the suitability of each site and the extent to which each scenario furthered the Authority's goals to:

- Support the implementation of the Urban Ring service;
- Support community needs and desires regarding site locations;
- Support bus operations and maintenance policy directives; and
- Minimize operations and maintenance costs.

The site evaluation criteria included:

- Site configuration;
- Operational efficiency (systemwide deadhead miles);
- Affected Community;
- Environmental considerations;
- Cost; and
- Other information as available for the site, including current plans for future use/development.

The findings for each scenario are presented herein.

Northern Service Area: Wellington Station

Overview

Wellington Station is located south of Revere Beach Parkway, east of the Orange Line, and northwest of the Mystic River canal. Exhibit 1 contains an aerial photograph of the site. The station has a center platform, and a pedestrian overpass provides access to/from the Commuter parking lot. The pedestrian bridge is approximately 13-feet high and provides adequate clearance for a single lane of bus traffic. The roadway may need to be lowered to accommodate CNG buses. There is a Kiss-N-Ride parking lot, and three (3) bus loading/unloading bays. There are approximately 1,038 parking spaces available to commuters. The area of the MBTA parcel, east of the Orange Line, is 10.5 acres. The parcel is located fairly distant from sensitive abutters, with the Kiss 108 Radio station being the nearest commercial parcel.

Summary of Proposed Actions

- Construct a bus maintenance facility at Wellington Station for the maintenance of 250 buses and the storage of a maximum of 190 buses.
- Close the Fellsway Garage.
- Discontinue maintenance services at the Lynn Garage.
- Reassign vehicles to provide more capacity in other garages without changes in pullout/pullback mileage.
- Reduce the size of and activity at Lynn Garage with possible North Shore-Boston service layovers at Charlestown or Wellington.

Site Configuration

The facility as planned is to maintain 250 buses, and store 190 buses. Exhibit 2 illustrates the layout of the proposed facility at Wellington Station. The bus fuel type is environmentally clean diesel, and all facilities will incorporate provisions for future conversion to other alternative fuels. The Maintenance building will have twenty (20) repair bays with pull through capability. Four (4) of the repair bays will be designed to handle 60-foot articulated buses. The adjacent Maintenance Building support area will be on two-levels. Above the Servicing Area will be 10,500 square foot transportation (drivers/operations) facility.

The Servicing Area will provide three (3) lanes for bus fueling, fare retrieval, and washing, occupying a total of 28,000 square feet. Approximately 175 buses will be parked on the ground level below the automobile parking garage; five buses will be parked in the fueling area and ten buses will be parked outdoors.

A new four-level parking garage will accommodate 1,232 cars for employee and commuter parking. The garage will have a 30-feet wide entry-ramp (10% grade), and a similar exit-ramp. The second level will be 20-feet above grade, and will have approximately 332 parking spaces, with some spaces located above the bus wash/fueling area. The third level will be 30-feet above grade, and will have approximately 300 parking spaces. The parking garage foundation and superstructure can be designed to allow for future vertical expansion. This would allow for capability to expand to 1,532 automobiles (five levels), or 1,832 cars (six levels). Eliminating the ticket booth fare collection system, and implementing a farebox honor system will greatly improve the traffic flow entering and exiting the parking garage. A separate surface lot will provide 98 additional employee parking spaces.

There will be two bus pick-up/drop-off lanes, accommodating twelve (12) buses, and a drop-off parking area with approximately eighteen (18) diagonal parking spaces.

Summary of Operational Impacts

- Systemwide pullout/pullback mileage will be unchanged.
- Systemwide garage capacity will increase by 103 vehicles, primarily at Charlestown.
- Proposed Urban Ring northside service (50 vehicles) can be housed at Charlestown Garage.

Tables 1 through 3 detail the systemwide operational impacts – pullout/pullback mileage and vehicle reassignments – of the Wellington bus maintenance garage scenario.

Exhibit 1: Aerial Photograph of Wellington Station

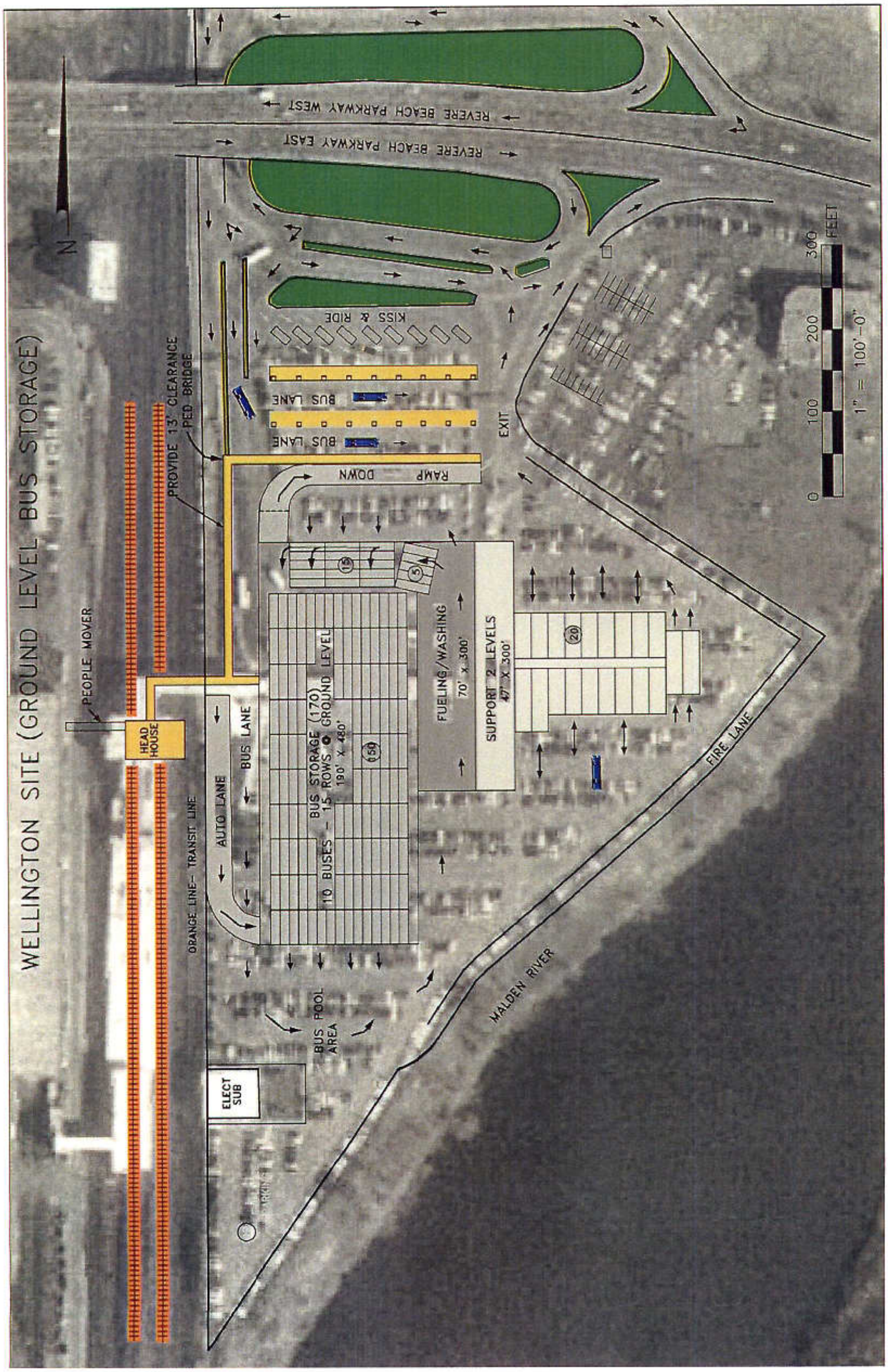
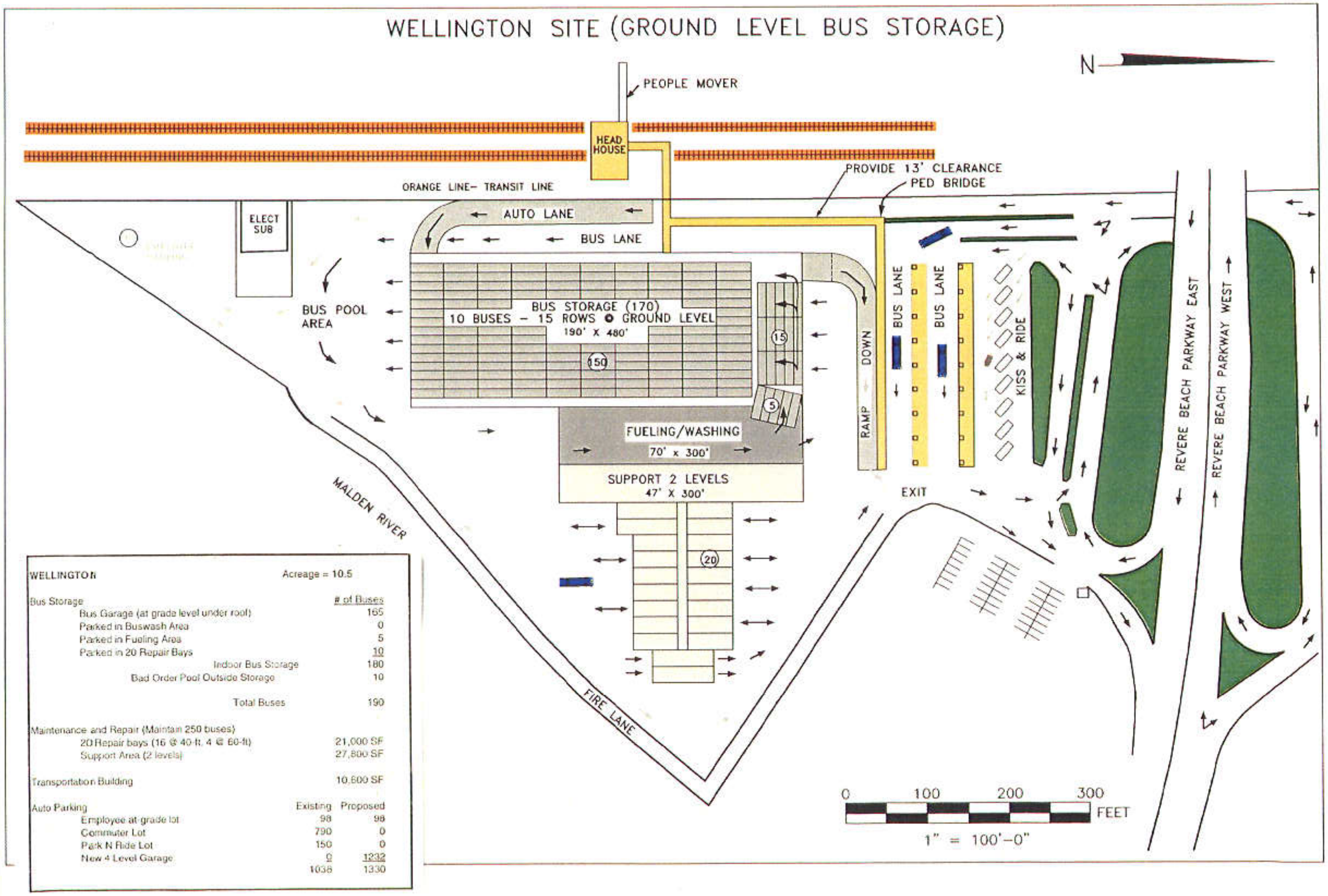


Exhibit 2: Layout of the Proposed Wellington Bus Maintenance Facility



WELLINGTON		Acreage = 10.5
Bus Storage		# of Buses
Bus Garage (at grade level under roof)		165
Parked in Buswash Area		0
Parked in Fueling Area		5
Parked in 20 Repair Bays		10
Indoor Bus Storage		180
Bad Order Pool Outside Storage		10
Total Buses		190
Maintenance and Repair (Maintain 250 buses)		
20 Repair bays (16 @ 40-ft, 4 @ 60-ft)		21,000 SF
Support Area (2 levels)		27,800 SF
Transportation Building		10,600 SF
Auto Parking	Existing	Proposed
Employee at grade lot	98	98
Commuter Lot	790	0
Park N Ride Lot	150	0
New 4 Level Garage	0	1232
	1038	1330

Affected Community

Based on income and minority population data prepared by the Central Transportation Planning Staff, the traffic analysis zones (TAZs) in which the Wellington garage is located in and adjacent to are characterized as non-minority[2], and at the MPO median income range[3].

Table 1: Proposed Wellington Garage – Pullout/Pullback Mileage

	Weekdays	Saturday	Sunday	Total
Existing Systemwide Weekly Mileage	52,064	4,256	3,862	**60,183**
System Changes				
Somerville Routes to Wellington: 62, 76, 77,79, 80, 87, 350, 351	(4,341)	(409)	(353)	(5,103)
Charlestown Routes to Wellington: 90, 106, 108, 110, 325, 326, 352	(2,778)	(161)	(110)	(3,049)
Lynn Routes to Wellington: 114, 116, 117, 119, 120, 121	(2,472)	(245)	(191)	(2,909)
Fellsway Garage Closed: 94, 95, 96, 97, 99, 100, 101, 105, 108, 130, 131, 132, 134, 135, 136, 137, 354, 411, 430, 9300	(2,850)			(2,850)
Mileage to Wellington: 62, 76, 77, 79, 80, 87, 350, 351, 90, 106, 108, 110, 325, 326, 352, 114, 116, 117, 119, 120, 121, 94, 95, 96, 97, 99, 100, 101, 105, 108, 130, 131, 132, 134, 135, 136, 137, 354, 411, 430, 9300	12,423	849	626	13,898
Total New Systemwide Mileage				**60,170**
Net Change				**(13)**
Percent Change				**(0)**

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[2] Where a Minority population is defined as all persons identified as either non-white or multi-racial, as well as all persons of any race who were identified as Hispanic, and where the minority area is one whose minority population percentage in 2000 exceeded the minority population percentage of the MPO region. The population of the MPO region in 2000 was 3,066,394, of which 657,102 or 21.4% were members of a minority group.

[3] Where, based on 1999 median household incomes, a low income area is defined as one whose median household income is no more than 75% of the median household income of the MPO region, and where the median income of the MPO region in 1999 was estimated to be approximately $55,800.

Table 2: Proposed Bus Reassignment to Wellington Garage

	Vehicles Relocated AM Peak	Peak Vehicles +15% Spares	Current Garage Excess Capacity	Excess Capacity After Wellington Opens
Charlestown Routes 90,106,108,110, 325, 326, 352	30	35	27	109
Somerville Routes 62, 76, 77,79, 80, 87, 350, 351	41	47	See Charlestown	See Charlestown
Fellsway Routes 94, 95, 96, 97, 99, 100, 101, 105, 108, 130, 131, 132, 134, 135, 136, 137, 354, 411, 430, 9300	49	56		Facility Closed
Lynn Routes 114, 116, 117, 119, 120, 121	18	21	0	21
Fleet Size at Wellington		**159**		

Table 3: Proposed Northside Urban Ring Routes and Estimated Fleet Requirements

Proposed Route	Route Description		# of New or Additional Vehicles
CT2	Sullivan Sq.	Longwood	2
CT5	Sullivan Sq.	Logan	11
CT6	Chelsea	Kendall Sq.	7
CT8	Sullivan Sq.	Longwood	7
CT9	Kenmore	Harvard Sq.	7
EC2	Woburn International	Kendall Sq.	8
EC2	Riverside	Lechmere	8
Total New or Additional Vehicles			**50**

Environmental Concerns

- The adjacent Mystic River raises environmental concerns to be addressed further, including Orders of Condition for the local Conservation Commission (Pursuant to 310 CMR 10.00), and Chapter 91 License Waterways Permits.
- The sites should also be evaluated to determine if dredging and filling or disposal of dredge materials will be required during construction.

Costs

The capital cost estimates are detailed in Appendix B – VAL-BUS Computer Analysis. Table 4 summarizes the capital cost estimates for the Wellington bus garage. These estimates do not include environmental site remediation or specialized foundations. These estimates assume the site to be reasonably level, with utilities adjacent to the site.

Table 4: Wellington Capital Costs

	Minimum	**Recommended**
Facility	$42,093,204	$44,091,861
Site Work *(includes outside bus storage)*	$3,021,408	$4,197,388
Equipment	$4,731,750	$5,131,750
A/E Services (10%)	$4,984,636	$5,342,100
Contingency (20%)	$10,966,200	$11,752,620
Total Facility Cost	**$65,797,198**	**$70,515,718**

Modifications to the Lynn facility are estimated to be approximately $3,800,000. This estimate includes modifications to the existing facility at 25 percent of the cost of a new facility, or $3,446,000 and includes:

• Bus Washer/Reclamation System	$400,000;
• Fueling System	$250,000; and
• Equipment Upgrades	$100,000.

Other

In 1969, the MBTA granted the City of Medford the air rights over the entire Wellington Station area. The air rights are leased to the City of Medford at a nominal rent for a 99-year term. The air rights include right for support, access, utilities, and light and air. The Act also grants the City the right to tax the subleasee in the same manner and to the same extent as if such lessee were the owner of the land in fee. Further discussions with the City of Medford will be required as part of the construction of the parking deck.

If advantageous to both parties, the MBTA Credit Union could be relocated to the new Transportation building thus freeing up additional space on the parcel.

Northern Service Area: One Acorn Park (Alewife)

Overview

One Acorn Park is located along Route 2, North of Alewife Brook Parkway and the MBTA Alewife Station. Exhibit 3 contains an aerial photograph of the site. The site is privately owned by O'Neill Properties and Prudential Financial, and is available for purchase. The parcel is located fairly distant from residential neighbors, with a wooden buffer between the site and residential abutters.

The MBTA Alewife Station, located at the intersection of Alewife Brook Parkway and Cambridge Park Drive, Cambridge, is a short distance from this site. This Red Line station has approximately 2,600 parking spaces available to commuters, with twenty-four (24) handicapped spaces.

Summary of Proposed Actions

- Construct a bus maintenance facility at One Acorn Park for the maintenance of 250 buses and the storage of a maximum of 150 buses.
- Close the Fellsway Garage.
- Discontinue maintenance services at the Lynn Garage.
- Reassign vehicles to provide more capacity in other garages without changes in pullout/pullback mileage.
- Reduce the size of and activity at Lynn Garage with possible North Shore-Boston service layovers at Charlestown or Wellington.

Site Configuration

The facility is planned is to store and maintain 140 buses. The bus fuel type will be clean diesel, and the facilities will incorporate provisions for future conversion to alternative fuels. The maintenance building will have internal bus circulation with ten (10) repair bays with pull through capability. The adjacent maintenance building support area totals 19,500 square feet. The transportation building located on the ground level area totals 5,500 square feet.

The Servicing Area will provide two lanes for bus fueling, fare retrieval, and washing and will total 12,500 square feet. Bus circulation and storage will be indoors and will house approximately 100 buses. Employee parking for approximately 150 cars will be provided at grade. The bus storage area will be an open deck construction, and the upper parking deck will be outdoors. Exhibit 4 illustrates the layout of the proposed facility at One Acorn Park.

Exhibit 3: Aerial Photograph of One Acorn Park / Alewife Station

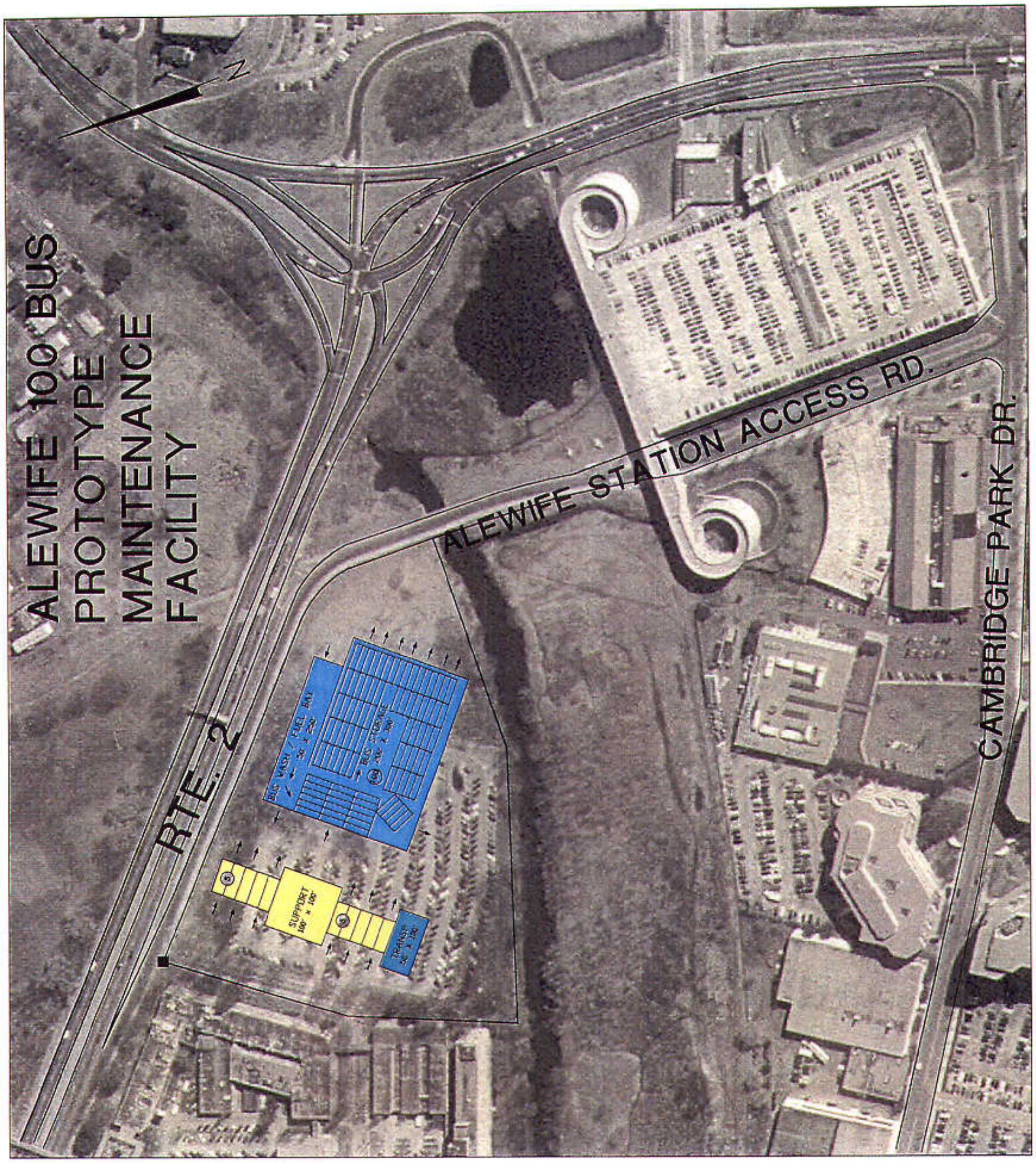
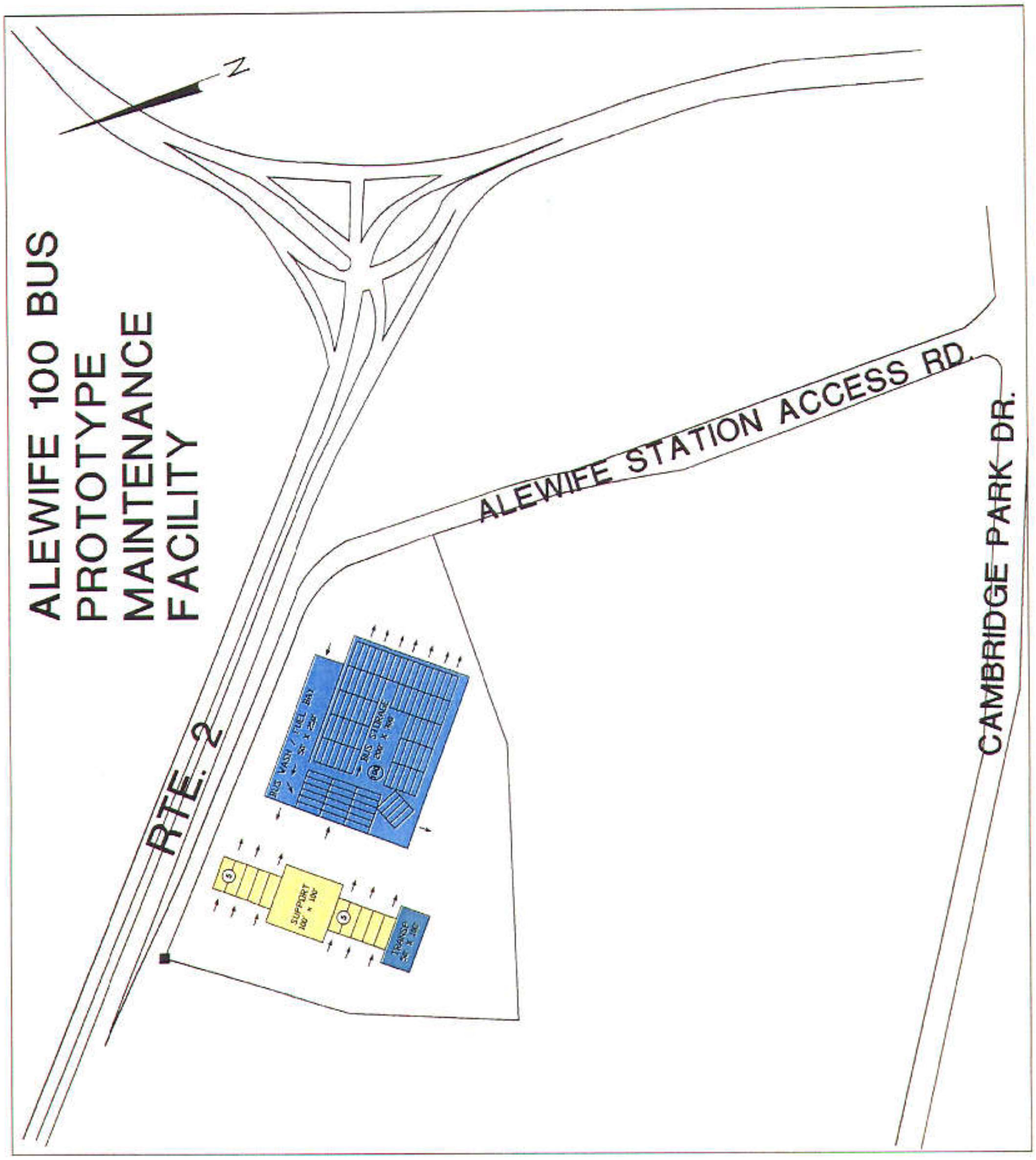


Exhibit 4: Layout of the Proposed One Acorn Park Bus Maintenance Facility



Summary of Operational Impacts

The proposed bus maintenance facility at One Acorn Park could house at least eighteen (18) routes that are now based in Somerville (Charlestown) with less pullout/pullback mileage than incurred in current operations. These routes operate in Cambridge, Somerville, Arlington, Belmont and other points north and west of Alewife.

- Pullout/pullback mileage for these routes would decrease by approximately 2,500 miles each week if relocated from Somerville to an Alewife garage.
- Pullout/pullback mileage of routes currently assigned to Fellsway would double if relocated to Alewife, and increase by about 70 percent if relocated to Charlestown.

Table 5 summarizes the estimated pullout/back mileage of relocating these eighteen (18) routes to Alewife.

Table 5: Alewife Garage – Pullout/Pullback Mileage

New Garage at Alewife	Weekday	Sat.	Sun.	Total
Existing Systemwide Weekly Mileage				60,183
Current Somerville Pullout/back Mileage for Routes: 62, 67, 68, 69, 74/75, 76, 77, 78, 79, 80, 83, 84, 85, 87, 88, 350/351	(6,119)	(617)	(526)	(7,262)
Projected Pullout/Pullback Mileage to Alewife for Above Routes:	3,903	444	431	4,778
Net Change – Somerville Routes Relocated to Alewife:				2,484)
Fellsway Garage Closed	(2,850)			(2,850)
Projected Pullout/back Mileage to Alewife for Fellsway Routes: 94, 95, 96, 97, 99, 100, 101, 105, 108, 130, 131, 132, 134, 135, 136, 137, 354, 411, 430, 9300	5,709			5,709
Net Change for Fellsway Routes:				2,859
Projected Pullout/back Mileage to Charlestown for Fellsway Routes: 94, 95, 96, 97, 99, 100, 101, 105, 108, 130, 131, 132, 134, 135, 136, 137, 354, 411, 430, 9300	4,457			4,457
Net Change for Fellsway Routes:				1,974
Projected Systemwide Mileage for One Acorn Park – Fellsway and Some Somerville Routes Relocated to Alewife				60,558
Percent Systemwide Change:				1%
Projected Systemwide Mileage for One Acorn Park - Some Somerville Routes Relocated to Alewife; Fellsway Routes Relocated to Charlestown				59,673
Percent Systemwide Change:				-1%

The eighteen (18) Somerville routes, shown in Table 6 represent 73 peak period vehicles, or approximately 84 vehicles including spares. If the Fellsway fleet was also reassigned to Alewife, the garage would need to accommodate at least 140 vehicles.

Table 6: Proposed Bus Reassignment to Alewife Garage

	Vehicles Relocated AM Peak	Peak Vehicles + 15% Spares	Current Garage Excess Capacity	Charlestown Capacity After Alewife Opens
Somerville Routes to Alewife: 62, 67, 68, 69, 74/75, 76, 77, 78, 79, 80, 83, 84, 85, 87, 88, 350/351	73	84	27	111
Fellsway Routes to Alewife: 94, 95, 96, 97, 99, 100, 101, 105, 108, 130, 131, 132, 134, 135, 136, 137, 354, 411, 430, 9300	49	56	Fellsway Closed	
Alewife Capacity		140		

If the Fellsway routes were relocated to the Charlestown garage, the result would be excess capacity of 55 vehicles at Charlestown, still sufficient to accommodate the planned Urban Ring bus expansion. Table 7 summarizes the impact of the reassignment of buses to the Charlestown garage.

Table 7: Proposed Bus Reassignment to Charlestown Garage

	Vehicles Relocated AM Peak	Peak Vehicles + 15% Spares	Current Garage Excess Capacity	Charlestown Capacity After Alewife Opens
Fellsway Routes to Charlestown: 94, 95, 96, 97, 99, 100, 101, 105, 108, 130, 131, 132, 134, 135, 136, 137, 354, 411, 430, 9300	49	56		55
Alewife Capacity		84		

Affected Community

Based on income and minority population data prepared by the Central Transportation Planning Staff, the traffic analysis zones (TAZs) in which the Alewife garage is located in and adjacent to are characterized as minority[4], and at the MPO 50%-75% median income range[5].

Environmental Concerns

- The adjacent to wooded areas raise some environmental concerns to be addressed further.

Costs

The capital cost estimates are detailed in Appendix B – VAL-BUS Computer Analysis. Table 8 summarizes the capital cost estimates for the Alewife bus garage. These estimates do not include environmental site remediation or specialized foundations. These estimates assume the site to be reasonably level, with utilities adjacent to the site.

Table 8: Alewife Capital Costs

	Minimum	**Recommended**
Facility	$22,386,190	$23,541,668
Site Work *(includes outside bus storage)*	$2,169,000	$2,222,533
Equipment	$2,165,000	$2,165,000
A/E Services (10%)	$2,672,019	$2,792,920
Contingency (20%)	$5,878,442	$6,144,424
Total Facility Cost	**$35,270,651**	**$36,866,545**

Modifications to the Lynn facility are estimated to be approximately $3,800,000. This estimate includes modifications to the existing facility at 25 percent of the cost of a new facility, or $3,446,000 and includes:

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[4] Where a Minority population is defined as all persons identified as either non-white or multi-racial, as well as all persons of any race who were identified as Hispanic, and where the minority area is one whose minority population percentage in 2000 exceeded the minority population percentage of the MPO region. The population of the MPO region in 2000 was 3,066,394, of which 657,102 or 21.4% were members of a minority group.

[5] Where, based on 1999 median household incomes, a low income area is defined as one whose median household income is no more than 75% of the median household income of the MPO region, and where the median income of the MPO region in 1999 was estimated to be approximately $55,800.

Bus Washer/Reclamation System	$400,000;
Fueling System	$250,000; and
Equipment Upgrades	$100,000.

Other

Development plans have been proposed for this site that combines a planned 245,000 square foot, state-of-the-art office / lab facility, which supports the desires of both Belmont and Cambridge plans for this area.

Northern Service Area: Revere at Northgate

Overview

The Revere Site is located north of Ward Street and west of Route 107. Exhibit 5 provides an aerial photograph of the Revere site. The MBTA currently does not have a facility in the vicinity of this site. The parcel is currently zoned industrial. The area of the parcel is 20 acres, including 6 acres at the western edge of the site, which is presently under agreement to a Storage Company. The parcel is located just south of a wetland area and abuts the Carlyle Apartment complex to the west. There is also the Village Court Condominium complex located to the south of Ward Street. Additional condominiums on the south side of Ward Street may be planned. The current use of the property is as a junkyard. Exhibit 6 provides pictures of the adjacent condominium communities. There are some warehouse structures located near the southeast corner of the site, which will require demolition.

Summary of Proposed Actions

- Opening of new garage with a capacity of 250 buses.
- Closure of Fellsway Garage.
- Closure of Lynn Garage.
- Reassignment of vehicles to provide more capacity at Charlestown for proposed Northside Urban Ring service.

Site Configuration

The facility as planned is to maintain and store 250 buses. Exhibit 7 illustrates the proposal facility layout. All areas of this proposed facility, including bus storage, will be enclosed, interior circulation. The bus fuel type is clean diesel, and all facilities will incorporate provisions for future conversion to alternative fuels. The Maintenance Building will have twenty (20) repair/inspection bays, some with pull through capability. Of the twenty (20) bays, four (4) will be repair bays for 60-foot buses. The Maintenance Building will total 64,000 square feet. The transportation area totals 14,000 square feet.

• Bus Washer/Reclamation System	$400,000;
• Fueling System	$250,000; and
• Equipment Upgrades	$100,000.

Other

Development plans have been proposed for this site that combines a planned 245,000 square foot, state-of-the-art office / lab facility, which supports the desires of both Belmont and Cambridge plans for this area.

Northern Service Area: Revere at Northgate

Overview

The Revere Site is located north of Ward Street and west of Route 107. Exhibit 5 provides an aerial photograph of the Revere site. The MBTA currently does not have a facility in the vicinity of this site. The parcel is currently zoned industrial. The area of the parcel is 20 acres, including 6 acres at the western edge of the site, which is presently under agreement to a Storage Company. The parcel is located just south of a wetland area and abuts the Carlyle Apartment complex to the west. There is also the Village Court Condominium complex located to the south of Ward Street. Additional condominiums on the south side of Ward Street may be planned. The current use of the property is as a junkyard. Exhibit 6 provides pictures of the adjacent condominium communities. There are some warehouse structures located near the southeast corner of the site, which will require demolition.

Summary of Proposed Actions

- Opening of new garage with a capacity of 250 buses.
- Closure of Fellsway Garage.
- Closure of Lynn Garage.
- Reassignment of vehicles to provide more capacity at Charlestown for proposed Northside Urban Ring service.

Site Configuration

The facility as planned is to maintain and store 250 buses. Exhibit 7 illustrates the proposal facility layout. All areas of this proposed facility, including bus storage, will be enclosed, interior circulation. The bus fuel type is clean diesel, and all facilities will incorporate provisions for future conversion to alternative fuels. The Maintenance Building will have twenty (20) repair/inspection bays, some with pull through capability. Of the twenty (20) bays, four (4) will be repair bays for 60-foot buses. The Maintenance Building will total 64,000 square feet. The transportation area totals 14,000 square feet.

The Servicing Area will provide three (3) lanes for bus fueling, fare retrieval, and washing and will total 28,500 square feet. The Servicing Area is located to the south of the Maintenance Area. Bus storage will be indoors to the west of the Maintenance Area and will accommodate 236 buses in approximately 150,000 square feet. The remaining buses will be stored in the bus wash (2), fueling (2), and repair (10) bays.

At grade parking for employees will be constructed to the west and north of the building. This parking lot will accommodate 380 employee vehicles.

Exhibit 5: Photograph of the Condominiums Adjacent to the Revere Property

Carlyle House Apartment located on Ward Street, west of the site

Village Court Condominiums located at the corner of McCoba Street and Ward Street

Exhibit 6: Aerial Photograph of Revere Site

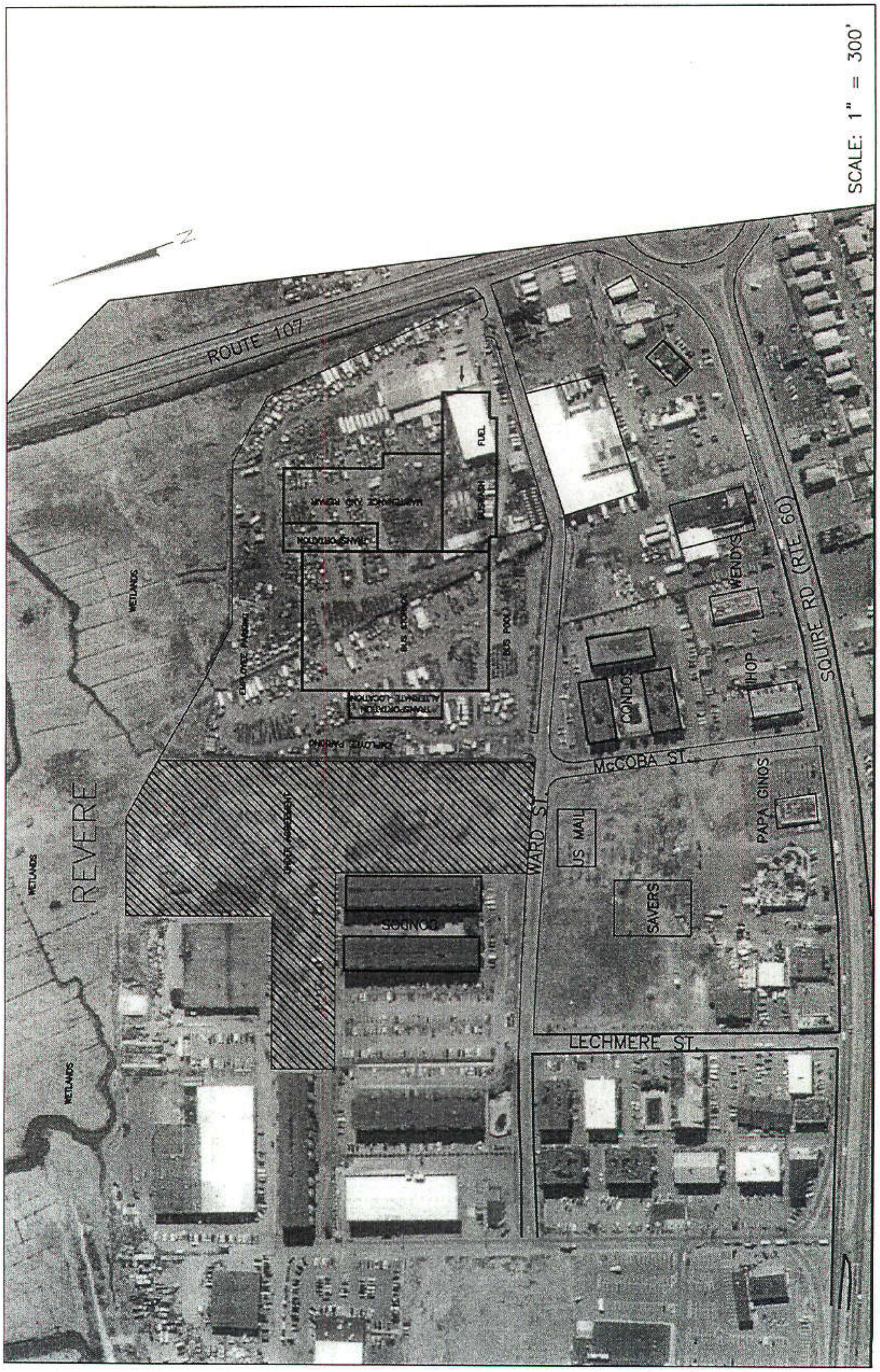
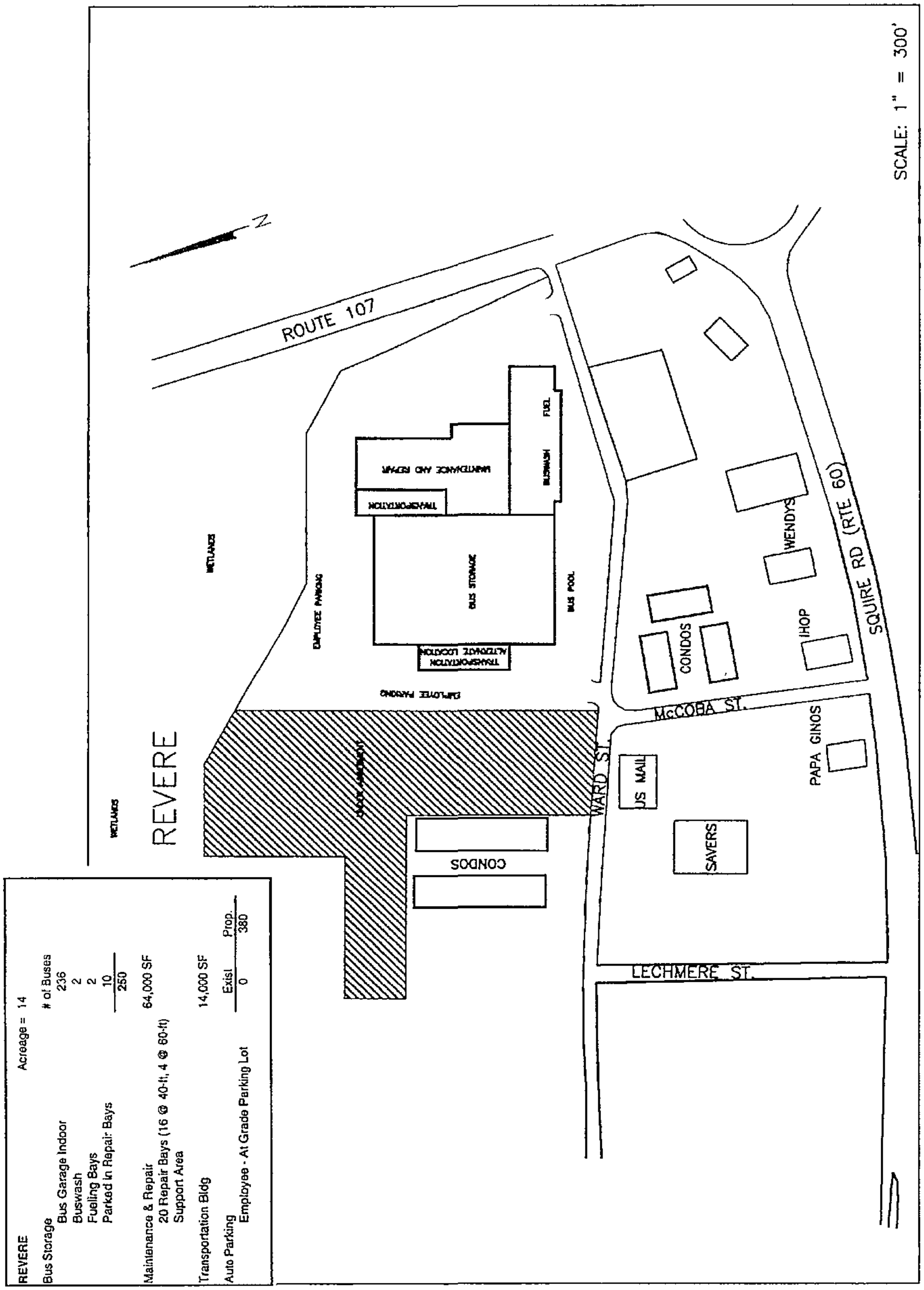


Exhibit 7: Proposed Layout of the Revere Facility



REVERE	Acreage = 14	
Bus Storage	# of Buses	
Bus Garage Indoor	236	
Buswash	2	
Fueling Bays	2	
Parked In Repair Bays	10	
	250	
Maintenance & Repair	64,000 SF	
20 Repair Bays (16 @ 40-ft, 4 @ 60-ft)		
Support Area		
Transportation Bldg	14,000 SF	
Auto Parking	Exist	Prop.
Employee - At Grade Parking Lot	0	380

Operational Feasibility

- Increase of eighteen percent (18%) in pullout/pullback mileage for the routes from the Charlestown garage; fewer routes moved would result in a lesser increase.
- A one-third increase in pullout/pullback mileage for Lynn routes which could be lessened considerably with schedule modifications.
- Fellsway mileage more than doubles since all of the Fellsway routes are located to the west of Revere.
- Proposed Northside Urban Ring service (50 vehicles) could possibly be housed at Charlestown Garage.

Tables 9 and 10 detail the systemwide changes in pullout/pullback mileage and the proposed reassignment of routes to the Revere facility.

Table 9: Proposed Revere Garage – Pullout/Pullback Mileage

Systems Changes at Revere	Total
Existing Systemwide Weekly Mileage	**60,183**
Lynn Garage Closed	(6,547)
Fellsway Garage Closed	(2,850)
Charlestown Routes to Revere 99, 108, 110. 111, 325, 326, 352	(3,078)
Mileage to Revere	18,566
Total Systemwide Mileage	**66,275**
Percent Change	**10%**

Table 10: Proposed Bus Reassignment to Revere Garage

	Vehicles Relocated AM Peak	Peak Vehicles +15% spares	Current Garage Excess Capacity	Excess Capacity after Northgate Opens
Fellsway	49	56	0	Facility Closed
Lynn	79	91	0	Facility Closed
Charlestown	22	25	27	52
Total Northgate		**172**		

Affected Community

As noted there are two condominium communities located near the Revere site. Based on income and minority population data prepared by the Central Transportation Planning Staff, the TAZs in which the Revere site is located and adjacent to are characterized as non-minority[6], and at 75 percent of the MPO median income range[7].

Environmental Considerations

Environmental impacts of both the junkyard and the wetlands to the north must be investigated.

Since the site is a junkyard, soil contamination is a real concern that would require further review before any decision to build on this site was finalized.

The adjacent wetlands may necessitate an Orders of Condition for the local Conservation Commission (Pursuant to 310 CMR 10.00); and an evaluation for Chapter 91 License Waterways Permits jurisdiction.

The site should also be evaluated to determine if facility construction require dredging and filling and/or disposal of dredge materials.

Costs

The capital cost estimates are detailed in Appendix B – VAL-BUS Computer Analysis. Table 11 summarizes the capital cost estimates for the Revere bus garage. These estimates do not include environmental site remediation or specialized foundations. These estimates assume the site to be reasonably level, with utilities adjacent to the site.

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[6] Where a Minority population is defined as all persons identified as either non-white or multi-racial, as well as all persons of any race who were identified as Hispanic, and where the minority area is one whose minority population percentage in 2000 exceeded the minority population percentage of the MPO region. The population of the MPO region in 2000 was 3,066,394, of which 657,102 or 21.4% were members of a minority group.

[7] Where, based on 1999 median household incomes, a low income area is defined as one whose median household income is no more than 75% of the median household income of the MPO region, and where the median income of the MPO region in 1999 was estimated to be approximately $55,800.

Table 11: Revere Capital Costs

	Minimum	Recommended
Facility	$33,891,674	$36,380,310
Site Work *(includes outside bus storage)*	$3,765,836	$3,851,593
Equipment	$3,290,000	$3,835,000
A/E Services (10%)	$4,094,751	$4,406,690
Contingency (20%)	$9,008,452	$9,694,719
Total Facility Cost	**$54,050,713**	**$58,168,312**

Northern Service Area: Mishawum Station and Commercial Avenue, Malden

Overview

The Mishawum Station and Commercial Avenue, Malden site are part of a two garage solution. Mishawum is located north of Route 128/I-95, south of Industrial Road, and west of the MBTA commuter rail line and Mishawum station. Exhibit 8 provides an aerial photograph of the Mishawum site. The new Woburn Regional Transportation Center is located one mile north of this facility, and the Mishawum Station will ultimately be decommissioned. The Mishawum station is currently a limited stop station for pedestrians only. A Massport Logan Express facility is located at this site and is no longer in service. The Logan Express facility is now located at the Woburn Regional Transportation Center. Commuter parking areas for the Logan Express and Mishawum Station have been closed. There are approximately 657 parking spaces located on the site, which are leased to a car dealer.

The Malden Site is located east of Commercial Street, south of Charles Street, and west of the Malden Canal. Exhibit 9 provides an aerial photograph of the Malden site. The parcel is privately owned by three parties; Custom Transportation (#144 Commercial St), Ace Hardware (#170), and Sterling, Clark, Lurton Corp (#184). The three parcels total only 3.1 acres. The site is zoned commercial and has scattered parking for approximately 40 cars and 20 truck trailers.

Summary of Proposed Actions

- Open two new garages - one at Malden with a 60 to 80 bus capacity and an additional garage at Mishawum for 100 buses.
- Closure of Fellsway Garage.
- Reassignment of vehicles to provide more capacity at Charlestown for proposed Northside Urban Ring service.
- Reduce the size of and activity at Lynn Garage with possible North Shore-Boston service layovers at Charlestown or Malden.

Exhibit 8: Aerial Photograph of the Mishawum Site

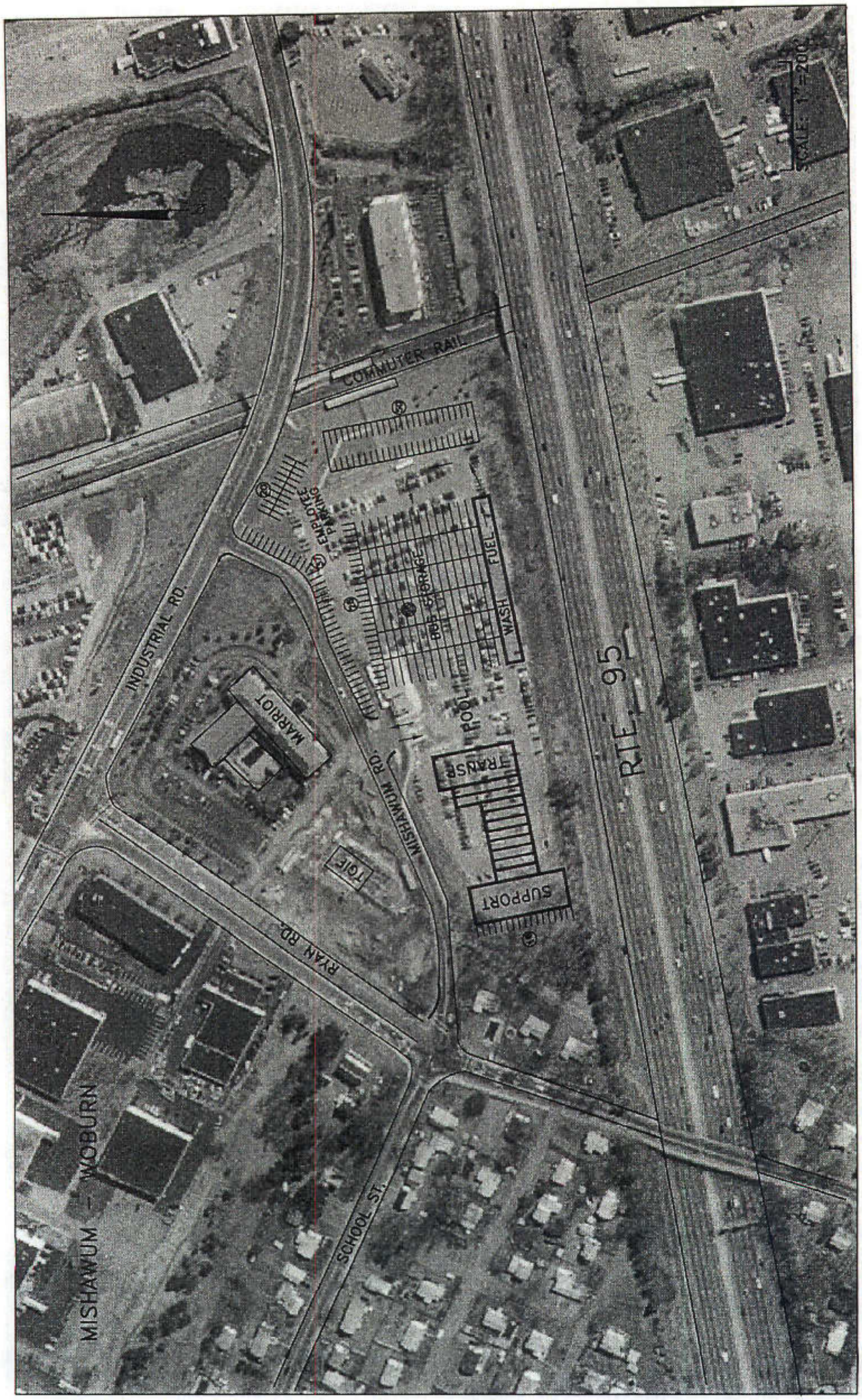
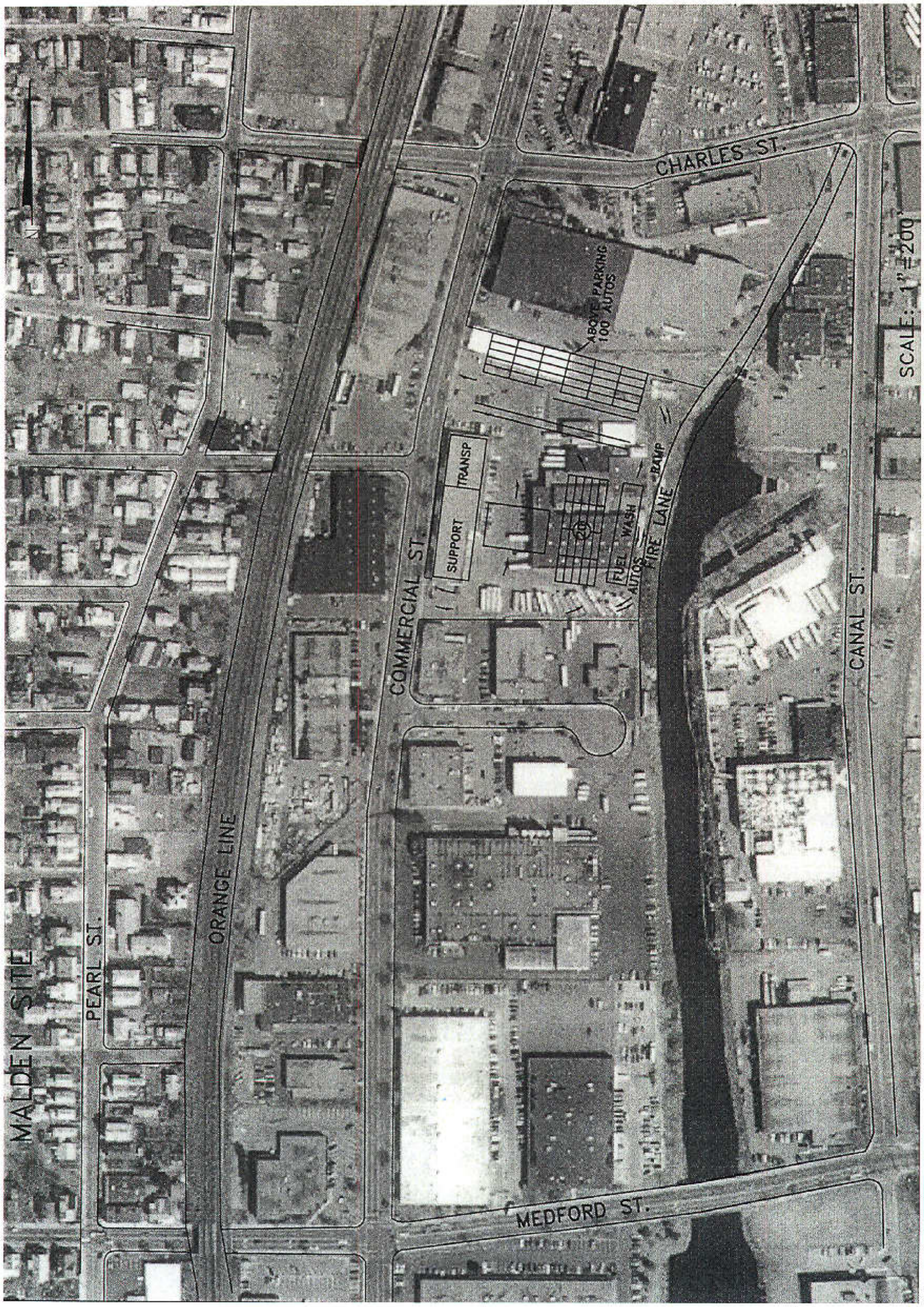


Exhibit 9: Aerial Photograph of the Malden Site



Site Configuration

Mishawum

The facility as planned is to maintain and store 100 buses. Exhibit 10 illustrates the proposed layout of the Mishawum facility. The bus fuel type is clean diesel, and all facilities will incorporate provisions for future conversion to alternative fuels. The Maintenance building will have internal bus circulation with ten (10) repair bays with pull through capability. The Maintenance Building area totals 20,000 square feet. The transportation area (5,400 square feet) is located east of the repair/maintenance bays.

The servicing area will provide two (2) lanes for bus fueling, fare retrieval, and washing and will total 7,500 square feet Bus circulation and storage will be outdoors and will house approximately 90 buses, with the remaining twelve (12) buses in the repair bays and service lanes. Employee parking for approximately 150 cars will be located in the yard areas north and east of the bus storage area.

Malden

The facility as planned is to maintain and store 80 buses. Exhibit 11 illustrates the proposed layout of the Malden facility. The bus fuel type is clean diesel, and all facilities will incorporate provisions for future conversion to alternative fuels. If feasible, the Ace Hardware store may be renovated to house the transportation area (4,000 square feet), and the Maintenance Building area is 15,600 square feet.

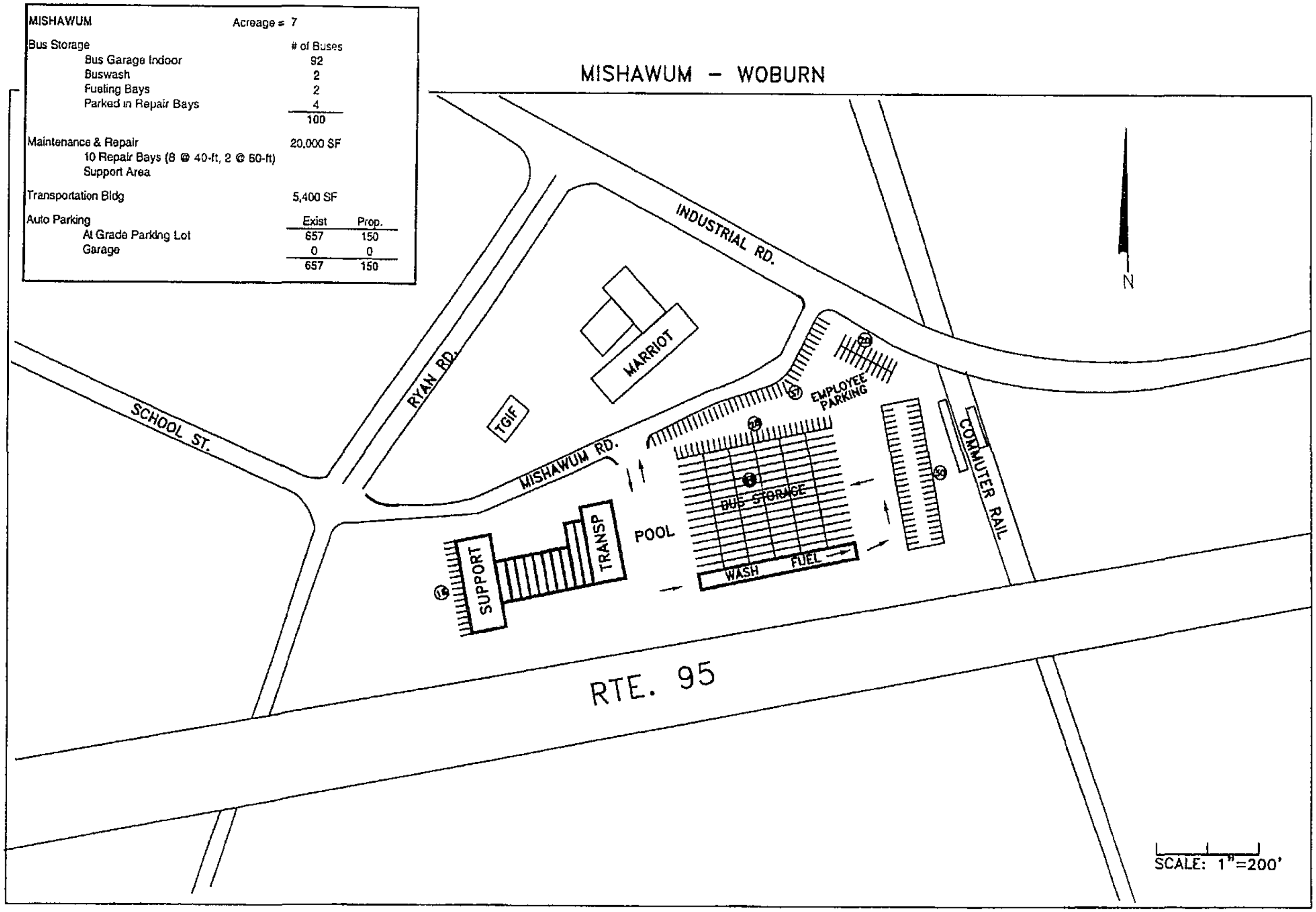
The Maintenance building will be located east of the Transportation building (existing Ace Hardware store). The Maintenance building will have external bus circulation with seven (7) repair bays with pull through capability. The Servicing Area will provide two (2) lanes for bus fueling, fare retrieval, and 1 washing lane and will total 10,500 square feet. Bus circulation and storage for 80 buses will be in two areas. The first area will be surface parking for 20 buses, and the second area will be for 60 buses below a parking deck. Employee parking will be on the parking deck and will hold approximately 100 cars in the north yard area.

Operational Feasibility

- There will be no increase in pullout/pullback mileage for vehicles reassigned to Malden, but increases for fleet housed at Mishawum Garage (Table 12).
- Minimal systemwide capacity expansion due to limited site size at Malden and distance from most routes to garage at Mishawum (Table 13).
- Under utilization of Mishawum due to the distance from the site to route origins and destinations.
- Proposed Northside Urban Ring service (50 vehicles) can possibly be housed at Charlestown Garage.

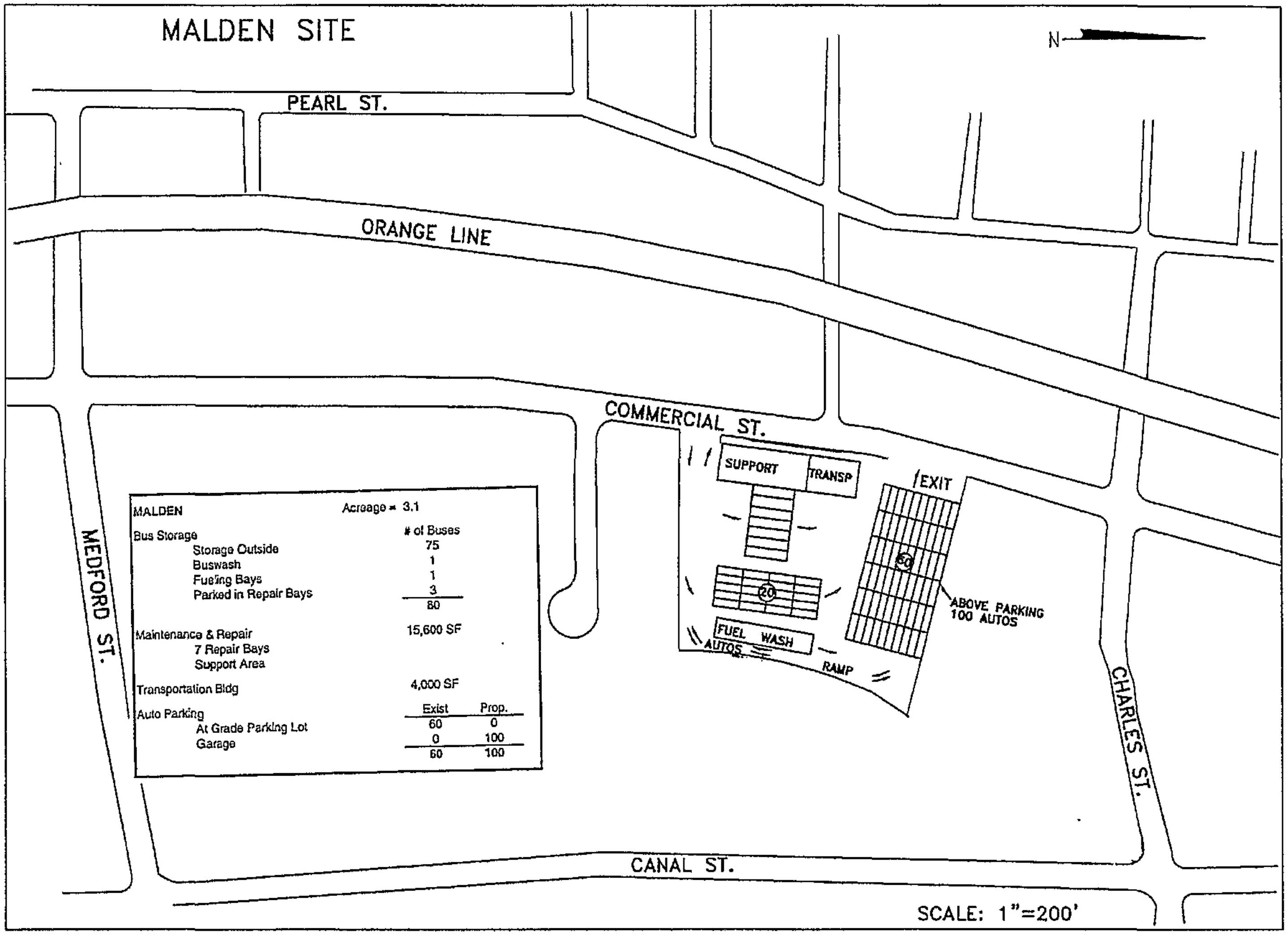
The following tables detail the systemwide change in mileage and the proposed reassignment of routes to the Malden and Mishawum garages.

Exhibit 10: Proposed Layout of the Mishawum Site



MISHAWUM	Acreage = 7	
Bus Storage	# of Buses	
Bus Garage Indoor	92	
Buswash	2	
Fueling Bays	2	
Parked in Repair Bays	4	
	100	
Maintenance & Repair	20,000 SF	
10 Repair Bays (8 @ 40-ft, 2 @ 60-ft)		
Support Area		
Transportation Bldg	5,400 SF	
Auto Parking	Exist	Prop.
At Grade Parking Lot	657	150
Garage	0	0
	657	150

Exhibit 11: Proposed Layout of the Malden Facility



MALDEN	Acreage = 3.1	
Bus Storage	# of Buses	
Storage Outside	75	
Buswash	1	
Fueling Bays	1	
Parked in Repair Bays	3	
	80	
Maintenance & Repair	15,600 SF	
7 Repair Bays		
Support Area		
Transportation Bldg	4,000 SF	
Auto Parking	Exist	Prop.
At Grade Parking Lot	60	0
Garage	0	100
	60	100

Table 12: Malden & Mishawum Garages – Pullout/Pullback Mileage

	Total
Existing Systemwide Weekly Mileage	**60,183**
System Changes at Malden:	
Lynn Routes to Malden 114, 116, 117, 119, 120, 121	(2,909)
Fellsway Garage Closed 94, 95, 96, 97, 99, 100, 101, 105, 108, 130, 131, 134, 135, 137, 411, 430, 9300	(2,470)
Mileage to Malden	**5,709**
System Changes at Mishawum:	
Charlestown Route 352	(958)
Somerville Routes 62, 76, 350/351	(2,936)
Fellsway Garage Closed 132, 135, 354	(380)
Mileage to Mishawum	**4,698**
New Systemwide Mileage	**60,397**
Percent Change	**1%**

Table 13: Proposed Bus Reassignment to Malden and Mishawum Garages

	Vehicles Relocated AM Peak	Peak Vehicles +15% Spares	Current Garage Excess Capacity	Excess Capacity After Malden Opens
Malden				
Fellsway Routes 94, 95, 96, 97, 99, 100, 101, 105, 108, 130, 131, 134, 135, 137, 411, 430, 9300	36	41	0	Facility Closed
East Boston/Revere Routes 114, 116, 117, 119, 120, 121	18	21	0	21
Fleet Size at Malden		**62**		
Mishawum				
Charlestown Route 352	6	7	27	50
Somerville Routes 62, 76, 350, 351	14	16	See Charlestown	
Fellsway 132, 136, 354				
Total Fleet Size at Mishawum		**38**		

Affected Community

Based on income and minority population data prepared by the Central Transportation Planning Staff, the TAZs in which the Mishawum site is located and adjacent to are characterized as non-minority[8], and above the MPO median income range[9].

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[8] Where a Minority population is defined as all persons identified as either non-white or multi-racial, as well as all persons of any race who were identified as Hispanic, and where the minority area is one whose minority population percentage in 2000 exceeded the minority population percentage of the MPO region. The population of the MPO region in 2000 was 3,066,394, of which 657,102 or 21.4% were members of a minority group.

[9] Where, based on 1999 median household incomes, a low income area is defined as one whose median household income is no more than 75% of the median household income of the MPO region, and where the median income of the MPO region in 1999 was estimated to be approximately $55,800.

Based on income and minority population data prepared by the Central Transportation Planning Staff, the area in which the Malden site is located is characterized as 50 to 75 percent minority[10], and at 75 percent of the MPO median income range[11].

Environmental Impacts

The Mishawum parcel is totally locked by surrounding streets, and future horizontal expansion is not feasible.

The creek adjacent to the Malden site may necessitate an Orders of Condition from the local Conservation Commission (Pursuant to 310 CMR 10.00) and an evaluation for Chapter 91 License Waterways Permits jurisdiction. Additional the site should be evaluated to ensure that dredging and filling and/or disposal of dredge material is not required for construction at this site.

Costs

The capital cost estimates are detailed in Appendix B – VAL-BUS Computer Analysis. Table 14 summarizes the capital cost estimates for the Mishawum and Malden bus garages. These estimates do not include environmental site remediation or specialized foundations. These estimates assume the site to be reasonably level, with utilities adjacent to the site.

Other

The Mishawum train station is a walk-up facility only. The Town of Woburn has requested that the train platforms and pedestrian access be maintained at this location.

At Malden, the existing Ace Hardware store adjacent to the Commercial Avenue parcel may be able to be renovated and house the Transportation and Maintenance Support functions. Soil and groundwater samples must be taken to assess any environmental problems at the site. The parcel is very small and potential for expansion is limited.

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[10] Where a Minority population is defined as all persons identified as either non-white or multi-racial, as well as all persons of any race who were identified as Hispanic, and where the minority area is one whose minority population percentage in 2000 exceeded the minority population percentage of the MPO region. The population of the MPO region in 2000 was 3,066,394, of which 657,102 or 21.4% were members of a minority group.

[11] Where, based on 1999 median household incomes, a low income area is defined as one whose median household income is no more than 75% of the median household income of the MPO region, and where the median income of the MPO region in 1999 was estimated to be approximately $55,800.

Table 14: Mishawum and Malden Capital Costs

Mishawum	**Minimum**	**Recommended**
Facility	$5,819,610	$6,975,088
Site Work *(includes outside bus storage)*	$2,451,516	$2,528,295
Equipment	$2,165,000	$2,165,000
A/E Services (10%)	$1,043,613	$1,166,838
Contingency (20%)	$2,295,948	$2,567,044
Subtotal Mishawum Costs	**$13,775,686**	**$15,402,266**
Malden	**Minimum**	**Recommended**
Facility	$7,018,949	$8,104,927
Site Work *(includes outside bus storage)*	$2,135,870	$2,209,211
Equipment	$1,155,000	$1,155,000
A/E Services (10%)	$1,030,982	$1,146,914
Contingency (20%)	$2,268,160	$2,523,210
Subtotal Malden Costs	**$13,608,960**	**$15,139,262**
Combined Costs	**$27,384,646**	**$30,541,528**

Southern Service Area: Watertown Car Barn

Overview

The Watertown Site is located north and east of Water Street, east of Galen Street, and south of Nonantum Road. Exhibit 12 provides an aerial photograph of the Watertown site. The MBTA currently has a bus stop shelter, an old car barn, and an MBTA transportation office on this site. The Charles River is located east of the site, and a GMC car dealership and the Exergen building is located along Water Street to the east. The MDC owns a small triangular parcel south of the site. There are overhead trolley wires surrounding the Transportation office located at the western corner of the site. The site has commuter parking which can accommodate approximately 200 cars, and commuters use a farebox honor pay system.

Summary of Proposed Actions

- Open a new garage at Watertown with capacity to store 70 to 90 vehicles.
- Reassignment of Albany Express service and Route 57, Watertown-Kenmore to Watertown providing more capacity at Albany Garage for Urban Ring southside service.

Site Configuration

The facility as planned is to maintain the western portion of the site and maintain the bus stop, bus shelter, Transportation office, and trolley wire system. Exhibit 13 illustrates the proposed layout of the Watertown facility. The existing car barn will be gutted, and will be renovated to store and maintain 66 buses. All areas of this proposed maintenance facility will be enclosed. The bus fuel type is clean diesel, and all facilities will incorporate provisions for future conversion to alternative fuels. The Maintenance Building will be in the old car barn, will have four (4) repair/inspection bays, set at an angle. All buses must back out of each repair bay. The Repair and Maintenance area will total 13,600 square feet. The transportation area totals 3,500 square feet.

The Servicing Area will provide one (1) lane for bus fueling, fare retrieval, and washing and will total 15,000 square feet. The Servicing Area is located to the south of the Maintenance Area. Bus storage will be covered by a parking structure and is located south of the Servicing Area and will accommodate 60 buses. The remaining buses will be stored in the bus wash (2), fueling (2), and repair (2) bays.

Parking for employees and commuters will be constructed above the bus storage area. The parking garage will have two (2) decks, at 20-feet and 30-feet above grade. A two-way helical drum will be located at the south end of the parking structure for entry and egress. The parking structure will hold 280 cars on two levels. The structural foundation could also be designed to accommodate future expansion. The transportation area will be located on the north-end of the new parking garage.

Exhibit 12: Aerial Photograph of the Watertown Site

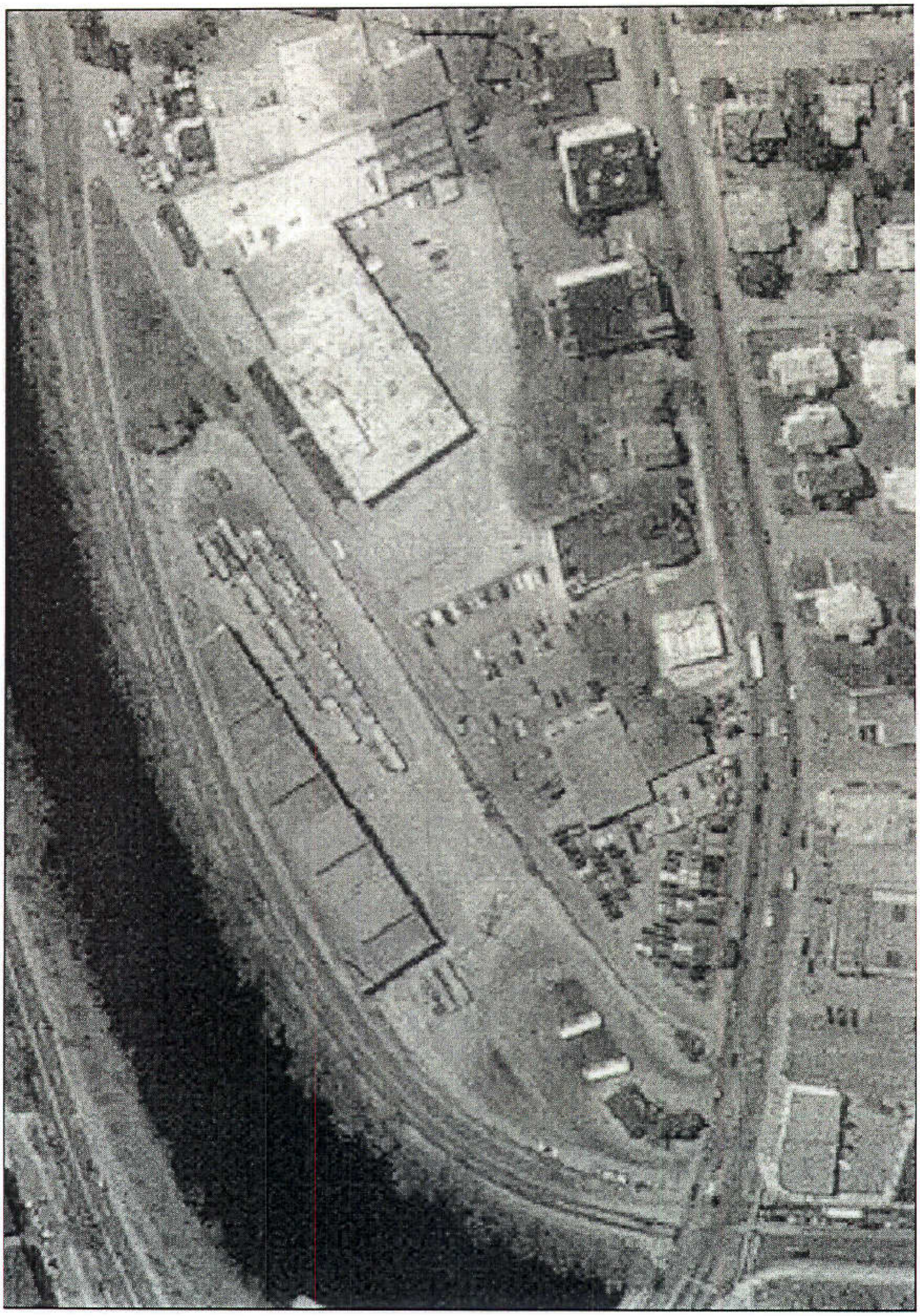
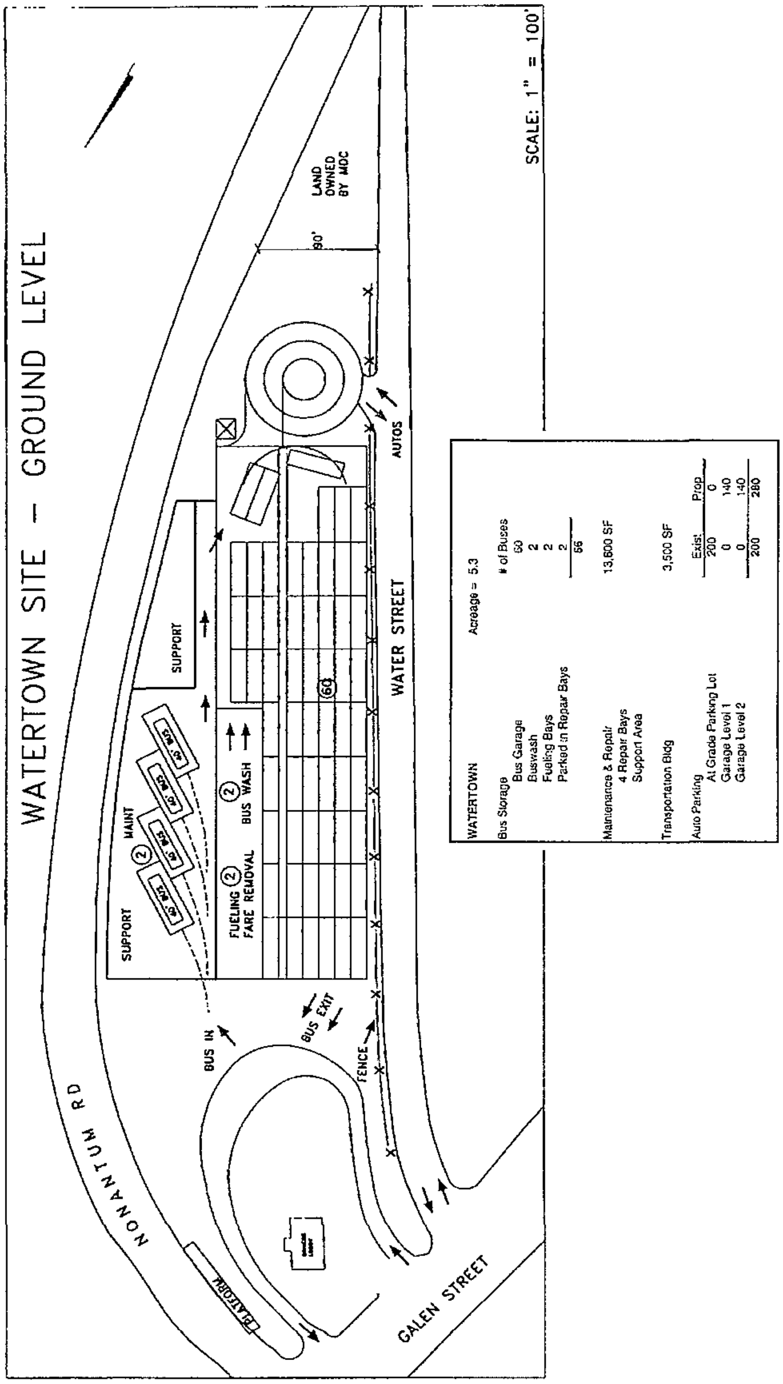


Exhibit 13: Proposed Layout of the Watertown Facility



WATERTOWN	Acreage = 5.3	
Bus Storage	# of Buses	
Bus Garage	60	
Buswash	2	
Fueling Bays	2	
Parked in Repair Bays	2	
	66	
Maintenance & Repair	13,600 SF	
4 Repair Bays		
Support Area		
Transportation Bldg	3,500 SF	
Auto Parking	Exist.	Prop.
At Grade Parking Lot	200	0
Garage Level 1	0	140
Garage Level 2	0	140
	200	280

Operational Feasibility

- Slight improvement in pullout/pullback mileage from reassignment of Albany buses to Watertown (Table 15).
- Decrease in the number of buses stored at Albany, allowing an expansion of its maintenance area (Table 16).
- Proposed southside Urban Ring routes (54 buses) can be housed at Albany Garage (Table 17).

The following tables detail changes in the systemwide pullout/pullback mileage, reassignment of buses and estimated fleet requirement.

Table 15: Proposed Watertown Garage – Pullout/Pullback Mileage

System Changes at Watertown	**Total**
Existing Systemwide Weekly	60,183
Albany Routes to Watertown 57, 59, 500, 501. 502, 504, 505, 553, 544, 556, 658	(8,489)
Mileage to Watertown	7,941
New Systemwide Mileage	59,636
Percent Change	**(1%)**

Table 16: Proposed Bus Reassignment to Watertown Garage

	Vehicles Relocated AM Peak	**Peak Vehicles +15% Spares**	**Current Garage Excess Capacity**	**Excess Capacity After Watertown Opens**
Albany Routes 57, 59, 500, 501, 502, 504, 505, 553, 544, 556, 558	75	86	12	98
Fleet Size at Watertown		**86**		

Table 17: Proposed Urban Ring Routes and Estimated Fleet Requirements

Route Number	Route Destination		# of Vehicles
CT1	Central Sq.	Andrew Sq.	2
CT3	Logan	Longwood	7
CT4	Ruggles	UMass Campus	7
CT7	Franklin Park	Kendall Sq.	10
CT10	Kenmore	JFK/UMass	7
CT11	Fields Corner	Longwood	8
EC3	Route 9, Natick	Kenmore	13
Total			**54**

Affected Community

Based on income and minority population data prepared by the Central Transportation Planning Staff, the TAZs in which the Watertown site is located and adjacent to are characterized as non-minority[12], and above the MPO median income range[13].

Environmental Impacts

Soil and groundwater samples must be taken to assess any environmental problems at the site. The parcel is very small and potential for expansion is limited.

The creek adjacent to the Watertown site may necessitate an Orders of Condition from the local Conservation Commission (Pursuant to 310 CMR 10.00) and an evaluation for Chapter 91 License Waterways Permits jurisdiction. Additional the site should be evaluated to ensure that dredging and filling and/or disposal of dredge material is not required for construction at this site.

Watertown is a confirmed disposed site under the Massachusetts Contingency Plan and has achieved Response Action Outcome (RAO) status that indicates no further action on the property is necessary. However the RAO includes a deed restriction since residual contamination is present at the site and special techniques or construction implementation plans will be required for construction.

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[12] Where a Minority population is defined as all persons identified as either non-white or multi-racial, as well as all persons of any race who were identified as Hispanic, and where the minority area is one whose minority population percentage in 2000 exceeded the minority population percentage of the MPO region. The population of the MPO region in 2000 was 3,066,394, of which 657,102 or 21.4% were members of a minority group.

[13] Where, based on 1999 median household incomes, a low income area is defined as one whose median household income is no more than 75% of the median household income of the MPO region, and where the median income of the MPO region in 1999 was estimated to be approximately $55,800.

Costs

The capital cost estimates are detailed in Appendix B – VAL-BUS Computer Analysis. Table 18 summarizes the capital cost estimates for the Watertown bus garage. These estimates do not include environmental site remediation or specialized foundations. These estimates assume the site to be reasonably level, with utilities adjacent to the site.

Table 18: Watertown Capital Costs

	Minimum	Recommended
Facility	$10,035,124	$10,813,322
Site Work *(includes outside bus storage)*	$1,904,927	$1,956,813
Equipment	$1,320,000	$1,320,000
A/E Services (10%)	$1,326,005	$1,409,013
Contingency (20%)	$2,917,211	$3,099,830
Total Facility Cost	**$17,503,267**	**$18,598,978**

Southern Service Area: Riverside Station

Overview

Riverside is located north of Grove Street, east of Route 128, and south and west of the MBTA rail maintenance facility. Exhibit 14 provides an aerial photograph of the Riverside site. This Green Line station has a side platform. There is a Kiss-N-Ride parking area, and several bus loading/unloading bays. There are approximately 675 parking spaces available to commuters. The MBTA parcel, south of the rail maintenance facility is approximately seven (7) acres. Exhibit 15 provides pictures of the southwest corner of the site, including the adjacent hotel. The adjacent parcels are the Holiday Inn Hotel (south) and the Golf Course (southeast).

Summary of Proposed Actions

- Establish a new garage at Riverside with capacity for 70-90 vehicles.
- Reassignment of Albany Express service and route 70, Cedarwood-Central Sq. to Riverside providing more capacity at Albany Garage for Urban Ring southside service and expanding capacity at Charlestown.

Exhibit 14: Aerial Photograph of the Riverside Site

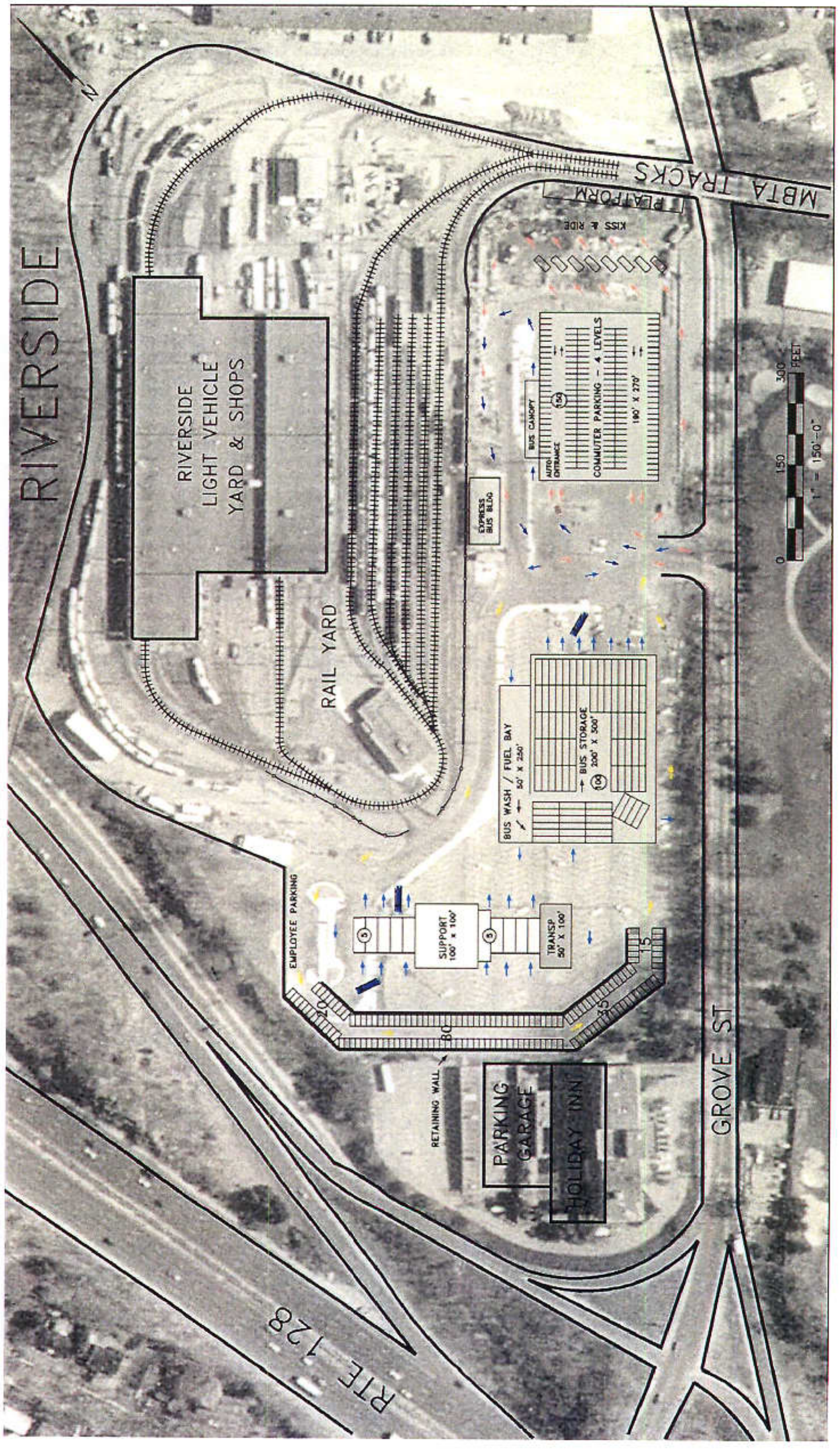


Exhibit 15: Southwest Corner of the Riverside Site

Southwest corner of site looking at Holiday Inn/retaining wall

Southwest corner of site looking at Holiday Inn

Site Configuration

The Riverside facility as planned is to maintain and store 100 buses. Exhibit 16 illustrates the proposed layout of the Riverside facility. The bus fuel type is environmentally clean diesel, and all facilities will incorporate provisions for future conversion to alternative fuels. The adjacent maintenance building will have ten (10 repair bays with pull through capability. The adjacent Maintenance Building support area totals 21,500 square feet. The transportation area totals 5,000 square feet.

The Servicing Area will provide two (2) lanes for bus fueling, fare retrieval, and washing and will total 12,500 square feet. All bus movements exiting the bus wash area will be internal, minimizing the visual and noise impact to the hotel adjacent to the site. Bus circulation and storage will be indoors. Approximately 100 buses can be stored at this facility. Employee parking for approximately 150 automobiles will be provided at-grade. The bus storage area will be an open deck construction, and the upper parking deck will be outdoors.

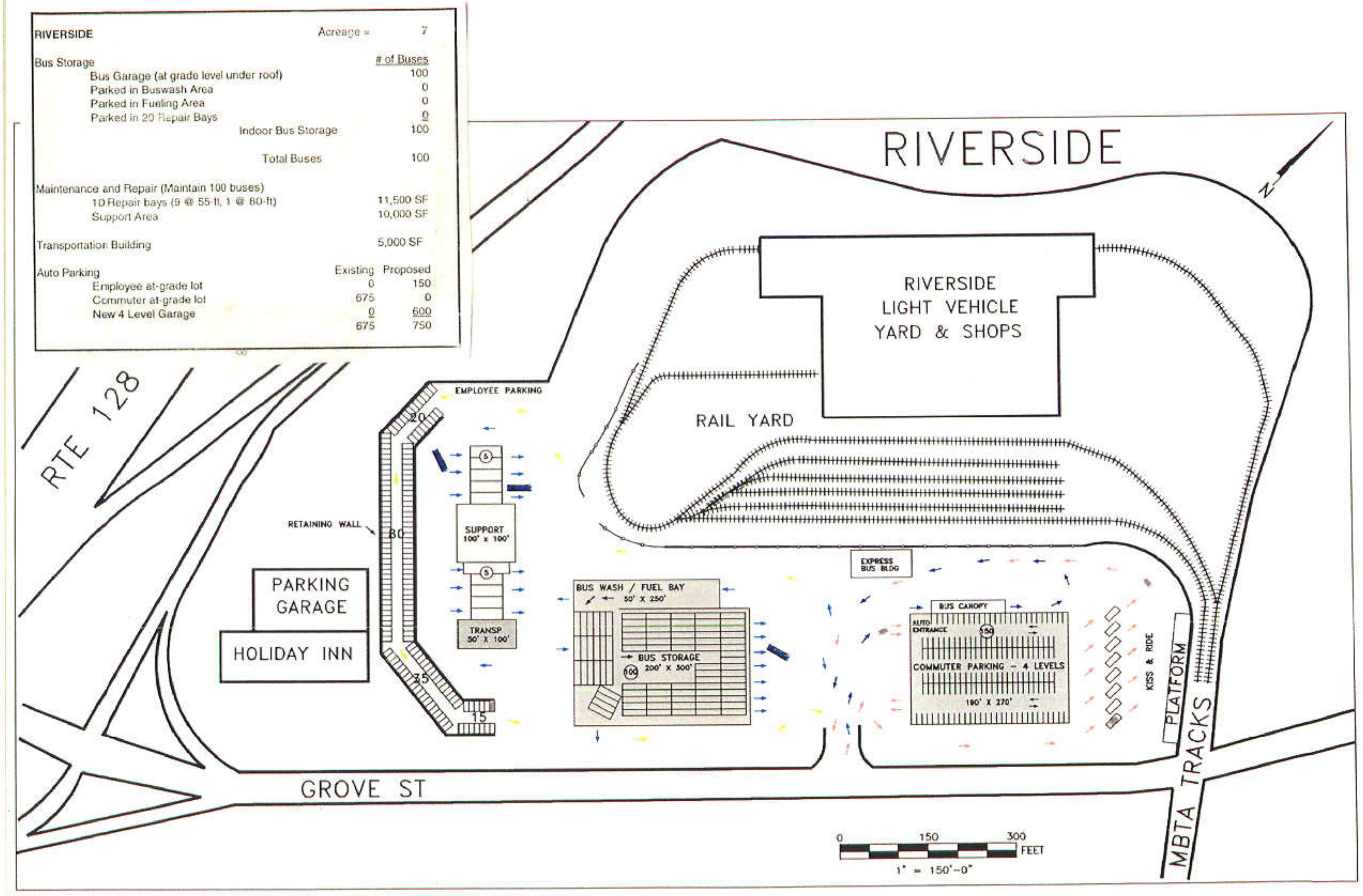
A new four-level parking garage will be constructed for commuter parking. At grade, there will be two to three ticket dispenser lanes, and three fare booths. The ground level will provide capacity for 150 parking spaces, and the three upper levels will accommodate 150 spaces each. The center aisle will have a sloping floor. In total, the parking garage should hold at least 600 automobiles, with capability to expand to a fourth level for an additional 150 parking spaces, or total capacity of 750 automobiles. An express bus canopy will be attached to the side of the parking garage for passenger drop-off\pick-up.

Operational Feasibility

- Large increase in pullout/pullback mileage from reassignment of Albany buses to Riverside; however schedule adjustments could minimize or eliminate the difference (Table 19).
- Large increase in pullout/pullback mileage from reassignment of Somerville route 70 to Riverside; however schedule adjustment could minimize the difference (Table 20).
- Proposed southside Urban Ring routes (54 buses) can be housed at Albany Garage (Table 21)
- Decrease in the number of buses stored at Albany, allowing an expansion of its maintenance area (Table 22).

The following tables detail systemwide changes in pullout/pullback mileage and the reassignment of routes to garages.

Exhibit 16: Proposed Layout of the Riverside Facility



RIVERSIDE	Acreage =	7
Bus Storage		# of Buses
Bus Garage (at grade level under roof)		100
Parked in Buswash Area		0
Parked in Fueling Area		0
Parked in 20 Repair Bays		0
Indoor Bus Storage		100
Total Buses		100
Maintenance and Repair (Maintain 100 buses)		
10 Repair bays (9 @ 55-ft, 1 @ 80-ft)		11,500 SF
Support Area		10,000 SF
Transportation Building		5,000 SF
Auto Parking	Existing	Proposed
Employee at-grade lot	0	150
Commuter at-grade lot	675	0
New 4 Level Garage	0	600
	675	750

Table 19: Proposed Riverside Garage – Pullout/Pullback Mileage

System Changes at Riverside	Total Mileage
Existing Systemwide Weekly	**60.183**
Albany Routes to Riverside 59, 500, 501, 502, 504, 505, 544, 553, 556, 558	(5,354)
Somerville Route to Riverside 70	(803)
Mileage to Riverside	13,925
New Systemwide	**67,952**
Percent Change	**13%**

Table 20: Proposed Bus Reassignment to Riverside Garage

	Vehicles Relocated AM Peak	Peak Vehicles +15% Spares	Current Garage Excess Capacity	Excess Capacity After Riverside Opens
Albany Routes 59, 500, 501, 502, 504, 505, 544, 553, 556, 558	62	71	12	83
Somerville Route 70	11	13	27	40
Fleet Size at Riverside		**84**		

Affected Community

Based on income and minority population data prepared by the Central Transportation Planning Staff, the TAZs in which the Watertown site is located and adjacent to are characterized as non-minority[14], and above the MPO median income range[15].

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[14] Where a Minority population is defined as all persons identified as either non-white or multi-racial, as well as all persons of any race who were identified as Hispanic, and where the minority area is one whose minority population percentage in 2000 exceeded the minority population percentage of the MPO region. The population of the MPO region in 2000 was 3,066,394, of which 657,102 or 21.4% were members of a minority group.

Costs

The capital cost estimates are detailed in Appendix B – VAL-BUS Computer Analysis. Table 21 summarizes the capital cost estimates for the Riverside bus garage. These estimates do not include environmental site remediation or specialized foundations. These estimates assume the site to be reasonably level, with utilities adjacent to the site.

Table 21: Riverside Capital Costs

Riverside Capital Costs	**Minimum**	**Recommended**
Facility	$22,386,190	$23,541,668
Site Work *(includes outside bus storage)*	$2,169,000	$2,222,533
Equipment	$2,165,000	$2,165,000
A/E Services (10%)	$2,672,019	$2,792,920
Contingency (20%)	$5,878,442	$6,144,424
Total Facility Cost	**$35,270,651**	**$36,866,545**

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[15] Where, based on 1999 median household incomes, a low income area is defined as one whose median household income is no more than 75% of the median household income of the MPO region, and where the median income of the MPO region in 1999 was estimated to be approximately $55,800.

Recommended Options

Northern Service Area

Wellington presents a unique opportunity for the MBTA to accommodate the service expansion required by the Urban Ring Program and eliminate two very old, costly, and inefficient maintenance facilities, one of which has been a consistent source of resident complaints, with the construction of a single modern maintenance facility. The Wellington option has the following very desirable characteristics:

- The MBTA owns the property, and would not need to take property, thereby not effecting the tax base of the town.
- The Fellsway Garage could be demolished, and the land made available for development of a type more compatible with the needs and desires of the surrounding community.
- The Lynn Garage would be converted to a layover facility for bus storage, fueling, and washing, with only "pullout repairs" performed at the sight. This would eliminate the interior exhaust problem in the maintenance area. It would eliminate the overhead cost of operating a maintenance facility (facility and equipment repairs, site management, utilities, some part of the parts inventory, etc.). The Lynn Garage would continue to function as a Transportation Rating Station.
- The Wellington site has no abutters, with the Kiss 108 Radio Station as its nearest neighbor. Bounded by the Mystic River Canal, the MBTA Orange Line, and Highways, this site is non-disruptive to residents of the town.
- The vehicular access and road connections that characterize this site are efficient, and are not intrusive on residential streets.
- The net change in deadhead mileage over the current distribution of routes is near zero.
- All the anticipated requirements of the Urban Ring are served effectively and efficiently.
- The commuter parking structure presents an opportunity for business development as a joint development project.
- Commuters would have the same or greater parking capacity, conveniently located.

Southern Service Area

Although both Riverside and Watertown Car House are excellent alternatives for the expansion of bus capacity in the south service area, Riverside has superior traffic flow characteristics, is less intrusive on the neighborhood, and has greater fleet storage capacity.

The construction of a bus maintenance facility at Riverside would allow the MBTA to satisfy the needs of the Urban Ring in the south service area, while continuing to provide the excellent quality of service to it's current express route commuters. Implicit in this plan is the upgrade of the Albany Garage to increase its maintenance capacity as described earlier in this report.

The benefits of this plan are:

- All the Urban Ring requirements would be effectively and efficiently met by operations out of the Albany Garage, while express bus service would be easily displaced to the new Riverside facility.
- The MBTA owns the property, and would not need to take property, thereby not affecting the tax base of the town.
- The only abutter is the Holiday Inn. The impact on this commercial neighbor would be minimized by building the maintenance facility with all-internal circulation and entry/exit access from the side of the building farthest from the hotel. Bus storage will be even farther removed from the hotel.
- Commuter parking will, at a minimum, remain at current levels, and the commuter parking facility will be designed to accommodate an increase in commuter parking capacity.
- The vehicular access and road connections that characterize this site are efficient, and are, for the most part, not intrusive on residential streets.
- The deadhead mileage incurred by this scenario is somewhat greater than in the current route distribution. An administrative modification to the schedules could significantly reduce or eliminate the difference. An opportunity may exist for total mileage reduction by considering a mid-day layover of express buses at Albany and/or Cabot.
- The commuter parking structure presents an opportunity for business development as a joint development project.

Summary of Benefits of Overall Plan

The Plan as proposed would accommodate all the needs of the Urban Ring with no increase in the number of bus maintenance facilities (although there would be one additional Transportation Rating Station, e.g. bus storage location). The 77-year-old Fellsway garage, a constant source of disruption to residential neighbors, would be decommissioned. The Fellsway garage is currently operating as a maintenance facility, with the associated overhead, for a fleet of 63 buses. The net operating efficiency (total deadhead mileage) would remain approximately unchanged from the current distribution of routes. The plan would increase the total tax base if the Fellsway Garage land were privately developed. Commuters would suffer no reduction in parking, and may enjoy an increase. They will find parking more conveniently located. Private business may have the opportunity to participate in joint development of areas that are publicly owned. And finally, bus maintenance capability would, by this plan, be made adequate to accept and maintain the new technology rolling stock that will enter the MBTA fleet over the coming decades.

The Plan is designed to support the implementation of Urban Ring services, alleviate crowded conditions at the Charlestown bus maintenance facility, and to address the diversity of needs presented by the incorporation of new fuel technologies. By conservative and creative use of existing MBTA facilities, this Strategic Plan accomplishes those service needs while improving its relation to the communities it serves and permitting business opportunities and a possible increased tax base.

Environmental Considerations

The planning process, governed by federal, state and local regulations, will require additional consideration of environmental issues. Issues that may be of a particular concern in siting a bus maintenance facility include traffic, air, ecological and environmental quality, and noise impacts. To the extent possible and based on available information, likely impacts and the further study requirements are noted herein.

Traffic Impacts

During site visits, traffic circulation within the Wellington and Riverside sites and on the surrounding roadway network were observed, and intersections that could be impacted by the construction of the a new maintenance facility were identified.

Wellington

The infrastructure at the Wellington Station site is well-suited for a maintenance facility. From its location on Route 16 (Revere Beach Parkway) buses turn right to exit east. Buses exiting to the west travel under Route 16 and make a right turn onto Route 16 west. There is also an acceleration lane of several hundred feet to allow buses to gain speed before entering the traffic stream.

Two intersections were identified at this site that could be impacted by the construction of a new maintenance facility:

- The five-approach intersection of Route 16 (Mystic Valley Parkway) and Route 28 (Fellsway) processes large volumes of vehicles from Route 28 and Route 16. Because of the large number of bus drivers, maintenance personnel, and support staff necessary, the possible impact of the facility on this intersection is ***moderate.***
- At Route 16 (Fellsway) at Riverside Avenue, the impact is ***low***, because the intersection geometry and signal control minimize the number of conflicting traffic movements, allowing for smooth operation.

Possible intersections to be analyzed for an Environmental Impact Report:

- Route 16 and Route 28;
- Route 16 and Riverside Avenue;
- Route 16 East and Site Exit;
- Route 16 West and Site Exit; and
- Route 28 and Central Avenue/Medford Street.

Riverside

The roadway adjacent to the Riverside site is narrow, which may affect the affect the buses' ability to execute turns. Specifically two intersections were identified that could be impacted, in varying degrees, by the construction of a new maintenance facility.

- If left in its current geometry, the intersection of the site driveway and Grove street will be ***highly impacted***. There is no existing eastbound Grove Street left-turn lane to store the vehicles waiting to enter the site, so vehicles must queue behind left-turning vehicles. Because Grove Street provides direct access to I-95, the traffic volumes are significant during the peak hours, reducing the number and size of gaps in traffic for vehicles entering and exiting the site.
- The impact on the intersection of grove Street and the Riverside Center entrance is likely to be ***low***, because this intersection provides connections to mainly residential areas, and the number of buses using this intersection would be few.

Possible intersections to be analyzed for an Environmental Impact Report:

- Grove Street and Site Driveway;
- Grove Street and Riverside Center Entrance;
- Grove Street and Hancock Street;
- Grove Street and Woodland Avenue;
- Grove Street and Pine Grove Avenue; and
- Pine Grove Avenue and Cornell Street.

Air Quality

There are two issues related to air quality for the bus maintenance facility: the first is the air quality impacts that should be evaluated in finalizing the facility location and the second, is the air permitting required for the facility regardless of location. The air quality impacts of particular concern relative to the siting of a new bus maintenance facility are caused by the increased bus traffic to and from the facility along with increased traffic caused by employees working at the facility. These impacts are focused on localized increases in carbon monoxide (CO) concentrations at intersections most affected by traffic increases.

In order to determine the air impacts from the bus maintenance facility, a preliminary air quality impact analysis (i.e., micro-scale analysis) of anticipated pollutant emissions from the increased traffic volumes and flows in the facility area for each of the three top ranking sites should be completed if the following criteria are met. The Massachusetts Department of Environmental Protection (DEP) guidance on air quality analyses of indirect sources recommends that intersections with project related traffic increases of 10 percent or more and that operate at level-of-service (LOS) D or lower or will be degraded to LOS D or lower should be evaluated for air quality impacts. DEP also recommends that intersections with total approach volumes of 3,000 vehicles or more for any of the peak hour periods be considered for analysis as well.

The micro-scale analysis is performed to determine the impact of mobile source CO emissions at sensitive receptor locations in the facility area relative to the Massachusetts Ambient Air Quality Standards (MAAQS) due to increased traffic volumes. The primary CO standard is 35 ppm (40,000 ug/m3) for a 1-hour period and 9 ppm (10,000 ug/m3) for a 8-hour period, not to be exceeded more than once per year. These standards are designed to protect public health. The analysis is focused on CO impacts as this is the pollutant emitted in the greatest amounts from motor vehicles and can result in localized "hot spots" of high CO concentrations. Carbon monoxide impact analysis is also recommended by the U.S. Environmental Protection Agency (EPA) in its "Guideline for Modeling Carbon Monoxide from Roadway Intersections".

The purpose of the micro-scale analysis is to demonstrate that the project will not result in any violations of the MAAQS for CO in the facility area due to facility-related changes in traffic volumes. The purpose of the analysis is to demonstrate compliance with a health-based ambient standard and vehicle emissions are greatest during times of acceleration, deceleration, and idling. As such, the analysis is focused on the impacts at intersections, where members of the public are most likely to be exposed to the highest traffic related CO concentrations (i.e., sensitive receptors). The analysis is performed to estimate these impacts both with and without the bus maintenance facility to establish the project's effect on local air quality.

Regardless of the facility location, air pollutant emissions from the facility itself due to diesel exhaust and operation of small combustion devices for heating purposes or emergency generators may also need to be examined but are not generally of particular concern due to their minor impacts. Diesel exhaust emissions related to bus maintenance are typically sporadic and of short duration and have very localized impacts. Pollutant emissions from combustion equipment for space heating and emergency generators for such facilities are generally small enough to have inconsequential impacts.

The only likely air quality related permit for the facility that could be required is a construction permit (Plan Approval), depending on the level of air pollutant emissions from any combustion devices for heating purposes or emergency generators. If needed, the responsible agency for the review and approval of plans for new air pollution sources is the Massachusetts Department of Environmental Protection (DEP). For projects located at the candidate sites, the appropriate regional office to contact for new construction approval is the Northeast Regional Office in Wilmington.

The Massachusetts Air Pollution Control Regulations, codified in 310 CMR 7.00, contain two levels of application reviews: the Comprehensive Plan Application (CPA) and the Limited Plan Application (LPA). A CPA is required for new or modified sources with the potential to emit greater than 5 tons/year of a single air contaminant. A maximum heat input rate greater than 30 MMBtu/hour for distillate fuel oil firing or greater than 40 MMBtu/hour for natural gas firing qualifies a combustion source for a CPA.

An LPA is required for new or modified sources with the potential to emit less than 5 tons/year and greater than 1 ton/year of a single air contaminant. A maximum heat input rate between 10 and 30 MMBtu/hour for distillate fuel oil firing or between 10 and 40 MMBtu/hour for natural gas firing qualifies a combustion source for an LPA. The major difference between the two levels of review is generally the need for mathematical dispersion modeling to demonstrate compliance with the MAAQS for a CPA whereas it is not generally required for an LPA.

Noise Impact Assessment

Introduction

The operation of the new bus maintenance facility may present an actual or perceived source of excess noise in the community. A detailed analysis should be performed to determine the compliance of the facility with applicable noise regulations, identify potential noise sources, predict facility sound levels, mitigate noise sources as necessary, and level rank the sites.

Applicable Regulations

There are no applicable federal codes controlling the noise of bus maintenance facilities. The Massachusetts DEP has a noise regulation which limits the noise from stationary noise sources in residential areas to the ambient sound level plus 10 dBA. The DEP does not address the sound level from mobile sources such as buses. Any applicable municipal noise regulations will be identified and used in setting criteria for each site.

Noise Preliminary Screening

The audibility of a new noise source is a function of how much it increases the existing sound level. That is why the DEP puts a cap on a new facility increase in ambient sound at 10 dBA. In the site analysis the closest residential receptors for each proposed facility location will be determined from USGS maps or site inspections.

The ambient sound level at these receptors will then be determined based upon the land use in the area. A preliminary estimate of the facility sound level at the finalist sites should be prepared to assess the potential for noise impacts, taking into consideration the distance from the noise sources to the nearest residential receptor and the expected ambient sound level.

Detailed Assessment

A detailed noise impact assessment should be performed for the preferred site location to finalize the selection process. This assessment will include conducting sound level surveys in the vicinity of the finalist sites, predicting the expected facility sound levels, identifying and mitigating excess noise, and level ranking the sites.

The noise surveys will measure both the daytime and nighttime ambient sound level. The measurements will include the L90 levels, i.e. the level exceeded 90 percent of the time, which is used in assessing the noise from stationary noise sources. The equivalent sound level, Leq, will also be measured. The Leq is the metric most often used in assessing the noise from traffic related noise sources.

Sound levels predictions will then be made for expected facility noise levels. Typical noise sources to be considered include HVAC equipment, idling busses, and buses entering and leaving the facility. If site noise is potentially excessive, or in excess of DEP regulations, noise mitigation will be consider. Mitigation could include modifying the site arrangement, adding barrier walls, or quieting the HVAC systems.

Environmental and Ecological Impacts

There are several environmental regulations and policies that identify requirements that must be meet for the siting of a bus maintenance facility. These regulations are described below along with their applicability to the sites currently under consideration for the location of the facility.

MEPA/NEPA

This project may be funded, with both federal and state funds and therefore will require adherence to both the federal and state Environmental Policy Acts. The National Environmental Policy Act (NEPA) and the Massachusetts Environmental Policy Act (MEPA) requirements are expected to be documented in a combined report.

Pursuant to 301 CMR 11.00, an Environmental Notification Form (ENF) will be required to be submitted to the Massachusetts Secretary of Environmental Affairs MEPA Unit when a conceptual design has been finalized. Each site will need to be covered by an ENF and an alternatives analysis may be required. MEPA review of the ENF will take a statutory 30 days from the date it is published in the Environmental Monitor. The Secretary of Environmental Affairs will then make a determination as to whether an

Environmental Impact Report (EIR) is required for the project. Should an EIR be required the following issues may be of concern: traffic, noise, proximity to wetlands and other water resources, hazardous waste storage, water usage and discharge, etc.

The guidelines established under NEPA apply to the potential environmental impact of a project in which a federal agency is involved (e.g., funding assistance). The federal agency that provided the funding for this project can possibly complete the NEPA documentation with a standard declaration of Categorical Exemption which they may have used for other similar projects of this type. In the event that a project may result in adverse impacts to resources in the area of the finalist sites, the minimum NEPA documentation requirement is the preparation of an Environmental Assessment (EA). Following a statutory review and comment period, the conclusion of the EA is either a "Finding of No Significant Impact" (FONSI) or states that an Environmental Impact Statement is needed. If the EIS is needed the scope of the EIS is developed with the resources agencies that identified those impacts that could not be suitably addressed in the EA. If possible, combining the Massachusetts MEPA documentation and National NEPA documentation into one document will simplify the process.

Wetlands Protection Act

Pursuant to 310 CMR 10.00, Orders of Condition from local Conservation Commissions for the Wellington, Revere Site, Malden, Riverside Site, and possibly the Watertown site may be required prior to commencement of construction. Since none of the projects are directly within a wetland area, but are within the buffer zone, a Determination of Applicability can be sought from the Conservation Commissions. Designs for Revere, Riverside, Wellington, Watertown and Malden should be evaluated.

The Revere site is in proximity to the Rumney Marshes, which has been declared by the Secretary of Environmental Affairs as an Area of Critical Environmental Concern (ACEC) (See discussion under ACEC below). Because of its proximity to the Rumney Marshes, the Revere site might require a Notice of Intent.

Due to the urban nature of each of the sites, it is assumed that there will be no impact to habitat of rare or endangered species, however, the Natural Heritage Program must be consulted for verification.

Chapter 91 License Waterways Permit

A Waterways License is required under Chapter 91 for construction activities that are to be undertaken within the tidelands lying between the historical high water mark and the seaward limit of the Commonwealth's jurisdiction. Although the proposed site may not now be anywhere near the present high water mark of the tide, this issue must be reviewed and considered in the permitting process. Designs for Revere, Riverside, Wellington, Watertown and Malden should be evaluated for Chapter 91 jurisdiction.

Army Corps of Engineers Section 404 Permit

Pursuant to Section 404 of the Clean Water Act, a permit is required from the US Army Corps of Engineers for dredging and filling and/or the disposal of dredged material in navigable waters of the US. Currently, dredging or filling does not appear to be required at any of the sites. Designs for Revere, Riverside, Wellington, Watertown and Malden should be evaluated to ensure this is the case.

A permit under Section 10 of the Rivers and Harbors Act of 1899 will be required only if the project includes construction in or over navigable waters.

Stormwater Discharge Permit

A study should be completed to determine if the finalist sites will fall under a NPDES Stormwater General Permit, or whether an individual permit will be required. Assuming that the project could fall under a General Permit, stormwater management plan would need to be developed which would include Best Management Practices. A scope and outline of the plan is included in the General Permit.

A Construction NPDES Permit will also be required. A Notice of Intent requesting coverage under the general permit will need to be completed to document that Best Management practices for construction are employed to prevent the sedimentation to either nearby water bodies or to municipal stormwater systems which in turn discharge to waters of the United States. In addition, a stormwater Management form that identifies site specific conditions will need to be filed with MADEP. This permit will be required for all sites.

Coastal Zone Management (CZM) Consistency Review

As part of the Federal CZM program, the Massachusetts CZM office reviews construction activities that take place within, or affect the coastal zone of Massachusetts. Coastal Zone Management Policies will need to be reviewed and evaluated as they relate to those sites within the coastal zone, such as the Revere Site. The CZM office will not issue a consistency determination until the MEPA Certificate has been issued and the Massachusetts Historical Commission has signed-off on the project.

Massachusetts Chapter 21 E Compliance

The Watertown site is a confirmed disposal site under the Massachusetts Contingency Plan (MCP). The site has achieved Response Action Outcome (RAO) status that indicates no further action on the property is necessary. The RAO however includes a deed restriction since residual contamination is present at the site and special techniques or construction implementation plans will be required to construct a facility on this site. Massachusetts Chapter 21 E Compliance for the other properties should be addressed through an American Society of Testing and Materials (ASTM) Phase 1 and/or Phase II environmental assessment for the final sites in the selection process. For those sites with structures that must be demolished or remodeled, an assessment of the building materials should be completed to determine whether asbestos or lead based paint is present and if remediation is required.

State Historic Preservation Act

Project plans are required to be reviewed by the Massachusetts Historical Commission. This review will identify whether any properties listed in the State or National Register of Historic Places may be affected, to characterize any impacts, and to propose mitigation measures if necessary. Given the currently disturbed and developed nature of the proposed sites, it is not anticipated that any archaeological or cultural resources are present and not likely that a phased archaeological investigation will be required.

Area of Critical Environmental Concern

Areas of Critical Environmental Concern (ACEC) are areas within the Commonwealth of Massachusetts where "unique clusters of natural and human resource values exist and which are worthy of a high level of concern and protection." The Revere Site is in proximity to the Rumney Marshes ACEC. Designation of an area as an ACEC means that the ACEC Program coordinates closely with other state agencies regarding protection, management and stewardship. The ACEC Program will closely review projects that have the potential to impact ACECs. Through the MEPA process, the ACEC program will evaluate whether the project poses any adverse impact to the ACEC and to determine that the regulatory standards for protection are met.

Land

For the properties not currently owned or operated by the MBTA, a review of the Urban Development Plans and zoning laws should be conducted in order to ensure that use of the parcel for a bus maintenance facility is possible.

Rare Species

Determine if any site would impact threatened or endangered species or species of concern. Are any of the sites on or adjacent to an area mapped as a Priority Site of Rare Species Habitats and Exemplary Natural Communities.

Wetlands, Waterways and Tidelands

Is the Site within the Jurisdiction of Chapter 91. The project is considered a non-water dependent use. If one or more acres of waterway, tideland is impacted and an Environmental Impact Report would be mandatory.

Impacts to adjacent waterways and wetlands at Revere, Riverside, Wellington, Watertown and Malden should be evaluated.

Wastewater

Will wastewater be discharged to the sewer system? If so a wastewater discharge permit may be required from the publicly owned treatment works (POTW). Additionally, depending upon water quality, an onsite water treatment facility.

Solid or Hazardous Waste

What is the anticipated volume of hazardous waste generated during the maintenance activities. If hazardous wastes are generated, the facility will require a hazardous waste generator identification number.

Miscellaneous Impacts

The miscellaneous impacts to be considered are any irreversible or irretrievable commitments of resources (as per NEPA), and the assessment of impacts of construction activities (traffic, noise, dust, erosion, demolition, etc.). An alternatives evaluation will likely be required.

Environmental Permitting

Construction Permits/Local Building Permits

The construction and operation of the proposed maintenance facility will likely require additional typical construction and operation permits, which may include, but are not limited to the following:

- Permits for the demolition and disposal of demolition debris
- Spill Prevention, Control, and Countermeasures Plan for operation.
- Asbestos removal and disposal, if necessary
- Hazardous Waste generator status,
- NPDES for runoff for construction sites – (see above)
- Building Permits, Curb Cut permits, and other necessary local construction permits

As part of the MEPA process, an analysis may need to be performed for the purpose of determining the air quality impacts of anticipated pollutant emissions from mobile sources associated with changes in traffic caused by the bus maintenance facility. The analysis consists of two separate evaluations of air quality impacts for existing traffic conditions, future "no-build" traffic conditions, and future "build with mitigation" traffic conditions. These two evaluations include a micro-scale analysis to estimate maximum pollutant concentrations at individual intersections for each traffic condition and a meso-scale analysis to determine the effect of the project on regional air pollutant emissions.

Opportunities for Partnerships

Commuter Parking Structures

In the case of the three scenarios which contain the recommendation for the construction of a commuter parking structure (Wellington, Riverside, and Watertown Car Barn), the opportunity exists to perform that construction as a joint development project. In this type of project, the construction would be privately funded, with the rights to parking revenues, and concession revenues, if applicable, going to the private developer for some number of years, after which, the rights revert to the MBTA. This is similar, but not identical to the arrangement under which the current parking structure near Wellington station was built and operated.

This type of privatization would avert the capital costs associated with the design and construction of the parking structure, provide an opportunity for private business development, while retaining the ownership of the real estate and the right to direct its use as might benefit the needs of the MBTA passengers.

In the case of Wellington and Riverside, the commuter parking structure is separate from the bus storage and maintenance facilities. As such, the parking structure could be built first, displacing the existing surface parking with little or no disruption to commuters. After that structure is complete, and commuters' parking is provided to the desired levels, work could begin on the bus facilities without the expensive need for staging.

Funding

This Strategic Plan identifies six projects to be completed over the next seven years. The projects are:

Phase I Bus Facility Upgrades:

- **Quincy:** Structural modifications to the garage roof to provide for the maintenance of low floor buses. ($0.3 million)
- **Albany:** Convert indoor storage space to increase the size of the maintenance shop, create two (2) 70-foot bays to accommodate articulated buses, and convert three (3) positions to pit/platform configuration. One overhead crane. ($3.0 million)
- **Charlestown:** Repair/replace roof; repair/replace make-up air units (HVAC); and repair/replace overhead garage doors. Create pit/platform positions to accommodate 40-foot low floor buses, and upgrade lifts to the capacity necessary to lift the buses to be stored their. Provide at least one overhead crane. ($6.0 million)

Phase II-A Bus Facility Construction:

- **Wellington Bus Maintenance Facility:** Construct bus maintenance facility for the maintenance of 250 buses and the storage of 189 buses. ($65.8 to $70.5 million)
- **Lynn Rating Station:** Modifications to the existing Lynn facility for bus storage; install bus washer/reclamation system; upgrade fueling system; and upgrade equipment. ($3.8 million)

Phase II-B Bus Facility Construction:

- **Riverside Bus Maintenance Facility:** A new facility to accommodate the Urban Ring service needs in the vicinity of Routes I-90 or I-93 and inside Route 128 for the provision of service to many of the current and proposed (Urban Ring) express routes. The relocation of this service would free-up space at Albany garage for the introduction of some of the Urban Ring service. ($35.3 to $36.9 million)

Tables 22 summarizes the estimated total capital cost for proposed projects. Table 23 summarizes the estimated operating costs for the proposed sites at Wellington and Riverside as compared with estimated base costs. Operating costs estimates were developed in cooperation with MBTA Bus Operations and are based on $44.40 per hour and $2.72 per mile.

Table 22: Estimated Total Capital Costs

Project	Cost in Millions
Quincy Facility Upgrade	$0.3
Albany Facility Upgrade	$3.0
Charlestown Facility Upgrade	$6.0
Wellington Bus Maintenance Facility	$65.8 – $70.5
Lynn Facility Upgrade / Rating Station	$3.8
Riverside Bus Maintenance Facility	$35.3 - $36.9
Total Facility Cost	**$114.2 - $120.5**

Table 23: Estimated Total Operating Costs

Scenario	Systemwide Mileage	Pullout/Back Minutes	Estimated Cost	Change Over Base
Base	60,183	310,953	$393,804	
Wellington	60,170	310,883	$393,716	($88)
Riverside	67,952	307,698	$412,525	$18,948

Potential Funding Sources

The Authority seeks to minimize the impact of these projects on the Bus Maintenance Facilities capital budget by disposing of land to partially finance the construction of new facilities. For example, the Authority could use funds from the disposition of the Fellsway and Misahawum properties to offset the cost of constructing the bus maintenance facility at Wellington. Disposition of the Watertown property would help in financing the Riverside bus maintenance facility.

As previously noted, public-private partnerships in the construction and operation of commuter parking facilities at Wellington and Riverside could be sought to further offset the overall impact of these projects on the capital program.

Implementation Schedule and Benchmarks

The sequence of events that should accompany a service metamorphosis of the scale proposed is generally:

Site Selection

A number of alternatives have been evaluated in the course of this study, and a recommendation has been developed which makes efficient use of currently owned MBTA property. This eliminates the time and cost associated with land acquisition.

The north service area changes are the nearest term and should therefore be initiated first. Exhibit 17 illustrates the proposed implementation schedule for the Wellington and Riverside scenarios. This schedule assumes the planning process for a bus maintenance facility at Wellington will continue in 2003 with the environmental planning and community and public agency review activities beginning in June 2003. The schedule for Wellington is accelerated to expedite the completion of the bus garage in 2007. The schedule for Riverside is less fast-paced, as the completion date for this facility is 2010.

The following section provides an overview of the schedule using Wellington as an example. However, as illustrated in Exhibit 17, the Riverside facility would require the same sequence of activities.

Wellington

Planning

Planning, including environmental assessment, traffic analysis, community impact, and routing are incorporated in the production of the required Environmental Impact Statement (EIS). This process should be completed in fifteen (15) months from time of approval of the project. In the event a particularly difficult condition is encountered, the process could extend to eighteen (18) months.

Community Participation

The proactive involvement of the community should begin immediately upon finalization of this study. The duration of the formal community outreach program should be through the design phase of the project, and only "as required" during the construction process. Appendix C contains a proposed plan for community and public agency participation. The plan is to be executed during the planning and design phases of the project.

Design

The design process, including approvals and some permits (e.g. curb cuts, Fire Dept.) will require twelve (12) months for each phase of construction. The commuter parking structure would be built first, followed by the remainder of the bus facilities. Thus, the design for the commuter-parking garage can begin at such a time as the progress on the EIS shows there is little risk that the entire complex cannot be built. The worst case is that design begins after the EIS is complete and a Record of Decision is received. Design of the bus maintenance facility can proceed in parallel with the design and construction of the commuter-parking garage. It too, should require approximately twelve (12) months to complete.

Construction

The construction of the commuter-parking garage will be a fourteen (14) to sixteen (16) month project. This should be straightforward with a low probability for delay.

The bus maintenance facility and storage facilities are more complex, and will require eighteen (18) to 21 months to complete.

The construction would need to be sequenced, with the commuter parking structure built first so as to assure that parking, in adequate quantities, is available during the construction of the bus facilities.

Vehicle Procurement and Receipt

The process of initiating a competitive procurement for production buses (e.g. nothing special like the duel mode articulated buses) requires the writing of a specification and associated RFP, response by manufacturers, and award of contract. The un-accelerated time frame for this sequence of events is approximately six (6) to nine (9) months.

The time from award of contract to delivery of the first bus is dependent upon the manufacturer's order backlog, and can vary between nine (9) and 30 months. The time to complete the order is again, dependent upon the manufacturer's capacity, but is safely less than six (6) months for 100 buses.

Service Changes

Service changes would be primarily a change in the vehicle and operator schedules. Analytical work on this can begin at any time after the decision is made to proceed with this project. The time required to cut new schedules is certainly less than twelve (12) months.

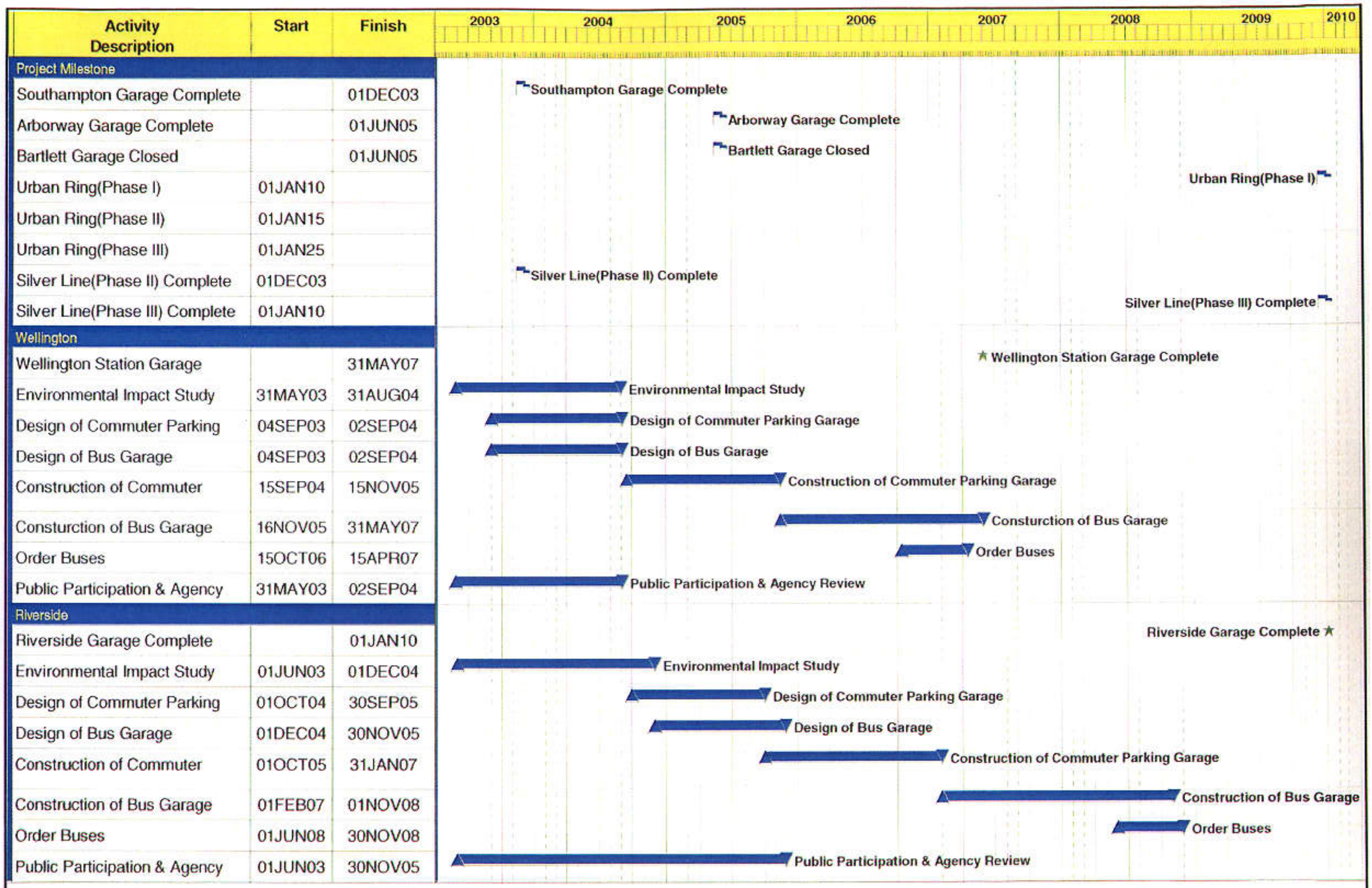
Once produced, some negotiations will be required prior to initiating a pick. This could be done at any time that is convenient, but should be entirely settled at least one pick prior to actually picking the new work.

The same considerations effect other represented groups (e.g. machinists, engineers, foremen, stockmen, etc.), but with less complexity. If the same time line is followed, these groups should be accommodated without causing delay.

Training

Training requirements are most demanding for the vehicle. The facility produced will require some training for the individual building systems as well as any new equipment installed. This facility-based training will be brief compared to the vehicle based training, which is normally incorporated in the vehicle delivery program, and occurs within the time allocated for the vehicle program. No special consideration need be given to this process under these conditions.

Exhibit 17: Proposed Implementation Schedule



Activity Description	Start	Finish
Project Milestone		
Southampton Garage Complete		01DEC03
Arborway Garage Complete		01JUN05
Bartlett Garage Closed		01JUN05
Urban Ring(Phase I)	01JAN10	
Urban Ring(Phase II)	01JAN15	
Urban Ring(Phase III)	01JAN25	
Silver Line(Phase II) Complete	01DEC03	
Silver Line(Phase III) Complete	01JAN10	
Wellington		
Wellington Station Garage		31MAY07
Environmental Impact Study	31MAY03	31AUG04
Design of Commuter Parking	04SEP03	02SEP04
Design of Bus Garage	04SEP03	02SEP04
Construction of Commuter	15SEP04	15NOV05
Consturction of Bus Garage	16NOV05	31MAY07
Order Buses	15OCT06	15APR07
Public Participation & Agency	31MAY03	02SEP04
Riverside		
Riverside Garage Complete		01JAN10
Environmental Impact Study	01JUN03	01DEC04
Design of Commuter Parking	01OCT04	30SEP05
Design of Bus Garage	01DEC04	30NOV05
Construction of Commuter	01OCT05	31JAN07
Construction of Bus Garage	01FEB07	01NOV08
Order Buses	01JUN08	30NOV08
Public Participation & Agency	01JUN03	30NOV05

Exhibit 17

Proposed Implementation Schedule

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